

LINKSYS[®]
A Division of Cisco Systems, Inc.



2,4GHz
802.11g

Wireless-G

ADSL Gateway

User Guide



Model No. **WAG54G (EU)**

CISCO SYSTEMS



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How to Use this Guide

Your Guide to the Wireless-G ADSL Gateway has been designed to make understanding networking with the Gateway easier than ever. Look for the following items when reading this User Guide:



This checkmark means there is a Note of interest and is something you should pay special attention to while using the Gateway.



This exclamation point means there is a Caution or Warning and is something that could damage your property or the Gateway.



This question mark provides you with a reminder about something you might need to do while using the Gateway.

In addition to these symbols, there are definitions for technical terms that are presented like this:

word: definition.

Also, each figure (diagram, screenshot, or other image) is provided with a figure number and description, like this:

Figure 0-1: Sample Figure Description

Figure numbers and descriptions can also be found in the “List of Figures” section in the “Table of Contents”.

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Chapter 1: Introduction

Welcome

The Linksys Wireless-G ADSL Gateway is the all-in-one solution for Internet connectivity in your home. The ADSL Modem function gives you a blazing fast connection to the Internet, far faster than a dial-up, and without tying up your phone line.

Connect your computers to the Gateway via the built-in 4-port 10/100 Ethernet Switch to jump start your home network. You can share files, printers, hard drive space and other resources, or play head-to-head computer games. Attach four computers directly, or connect more hubs and switches to create as big a network as you need. The built-in Wireless-G (802.11g) Access Point allows up to 32 wireless devices to connect to your network at data rates up to 54Mbps, without running cables through the house. It's also compatible with Wireless-B (802.11b) devices, at 11Mbps. The Gateway ties it all together and lets your whole network share that high-speed Internet connection.

To protect your data and privacy, the Wireless-G ADSL Gateway features an advanced firewall to keep Internet intruders and attackers out. Wireless transmissions can be protected by powerful data encryption. Safeguard your family with Parental Control features like Internet Access Time Limits and Key Word Blocking. Configuration is a snap with any web browser.

With the Linksys Wireless-G ADSL Gateway at the heart of your home network, you're connected to the future.

What's in this Guide?

This user guide covers the steps for setting up and using the Wireless-G ADSL Gateway.

- **Chapter 1: Introduction**
This chapter describes the Wireless-G ADSL Gateway Wireless-G ADSL Gateway applications and this User Guide.
- **Chapter 2: Planning Your Network**
This chapter describes the basics of networking.
- **Chapter 3: Getting to Know the Wireless-G ADSL Gateway**
This chapter describes the physical features of the Gateway.
- **Chapter 4: Connecting the Wireless-G ADSL Gateway**
This chapter instructs you on how to connect the Gateway to your network.
- **Chapter 5: Configuring the Gateway**
This chapter explains how to use the Web-Based Utility to configure the settings on the Gateway.
- **Appendix A: Troubleshooting**
This appendix describes some problems and solutions, as well as frequently asked questions, regarding installation and use of the Wireless-G ADSL Gateway.
- **Appendix B: Wireless Security**
This appendix explains the risks of wireless networking and some solutions to reduce the risks.
- **Appendix C: Configuring IPSec between a Windows 2000 Computer and the Gateway**
This appendix instructs you on how to establish a secure IPSec tunnel using preshared keys to join a private network inside the VPN Gateway and a Windows 2000 or XP computer.
- **Appendix D: Upgrading Firmware**
This appendix instructs you on how to upgrade the firmware on your Gateway if you should need to do so.
- **Appendix E: Finding the MAC Address and IP Address for your Ethernet Adapter.**
This appendix describes how to find the MAC address for your computer's Ethernet adapter so you can use the MAC filtering and/or MAC address cloning feature of the Gateway.
- **Appendix F: Glossary**
This appendix gives a brief glossary of terms frequently used in networking.

Wireless-G ADSL Gateway

- **Appendix G: Specifications**
This appendix provides the technical specifications for the Gateway.
- **Appendix H: Warranty Information**
This appendix supplies the warranty information for the Gateway.
- **Appendix I: Regulatory Information**
This appendix supplies the regulatory information regarding the Gateway.
- **Appendix J: Contact Information**
This appendix provides contact information for a variety of Linksys resources, including Technical Support.

Chapter 2: Planning Your Network

The Gateway's Functions

A Gateway is a network device that connects two networks together.

In this instance, the Gateway connects your Local Area Network (LAN), or the group of computers in your home or office, to the Internet. The Gateway processes and regulates the data that travels between these two networks.

The Gateway's NAT feature protects your network of computers so users on the public, Internet side cannot "see" your computers. This is how your network remains private. The Gateway protects your network by inspecting every packet coming in through the Internet port before delivery to the appropriate computer on your network. The Gateway inspects Internet port services like the web server, ftp server, or other Internet applications, and, if allowed, it will forward the packet to the appropriate computer on the LAN side.

Remember that the Gateway's ports connect to two sides. The LAN ports connect to the LAN, and the ADSL port connects to the Internet. The LAN ports transmit data at 10/100Mbps.



Figure 2-1: Network

IP Addresses

What's an IP Address?

IP stands for Internet Protocol. Every device on an IP-based network, including computers, print servers, and Gateways, requires an IP address to identify its "location," or address, on the network. This applies to both the Internet and LAN connections. There are two ways of assigning an IP address to your network devices. You can assign static IP addresses or use the Gateway to assign IP addresses dynamically.

Static IP Addresses

A static IP address is a fixed IP address that you assign manually to a computer or other device on the network. Since a static IP address remains valid until you disable it, static IP addressing ensures that the device assigned it will always have that same IP address until you change it. Static IP addresses must be unique and are commonly used with network devices such as server computers or print servers.

LAN: the computers and networking products that make up your local network



NOTE: Since the Gateway is a device that connects two networks, it needs two IP addresses—one for the LAN, and one for the Internet. In this User Guide, you'll see references to the "Internet IP address" and the "LAN IP address."

Since the Gateway uses NAT technology, the only IP address that can be seen from the Internet for your network is the Gateway's Internet IP address. However, even this Internet IP address can be blocked, so that the Gateway and network seem invisible to the Internet—see the Block WAN Requests description under Security in "Chapter 5: Configuring the Gateway."

Since you use the Gateway to share your DSL Internet connection, contact your ISP to find out if they have assigned a static IP address to your account. If so, you will need that static IP address when configuring the Gateway. You can get that information from your ISP.

Dynamic IP Addresses

A dynamic IP address is automatically assigned to a device on the network, such as computers and print servers. These IP addresses are called “dynamic” because they are only temporarily assigned to the computer or device. After a certain time period, they expire and may change. If a computer logs onto the network (or the Internet) and its dynamic IP address has expired, the DHCP server will automatically assign it a new dynamic IP address.

DHCP (Dynamic Host Configuration Protocol) Servers

Computers and other network devices using dynamic IP addressing are assigned a new IP address by a DHCP server. The computer or network device obtaining an IP address is called the DHCP client. DHCP frees you from having to assign IP addresses manually every time a new user is added to your network.

A DHCP server can either be a designated computer on the network or another network device, such as the Gateway. By default, the Gateway’s DHCP Server function is enabled.

If you already have a DHCP server running on your network, you must disable one of the two DHCP servers. If you run more than one DHCP server on your network, you will experience network errors, such as conflicting IP addresses. To disable DHCP on the Gateway, see the DHCP section in “Chapter 5: Configuring the Gateway.”

What is a VPN?

A VPN, or Virtual Private Network, is a connection between two endpoints - a VPN Gateway, for instance - in different networks that allows private data to be sent securely over a shared or public network, such as the Internet. This establishes a private network that can send data securely between these two locations or networks.

This is done by creating a “tunnel”. A VPN tunnel connects the two computers or networks and allows data to be transmitted over the Internet as if it were still within those networks. Not a literal tunnel, it is a connection secured by encrypting the data sent between the two networks.

VPN was created as a cost-effective alternative to using a private, dedicated, leased line for a private network. Using industry standard encryption and authentication techniques - IPSec, short for IP Security - the VPN creates a secure connection that, in effect, operates as if you were directly connected to your local network. Virtual Private Networking can be used to create secure networks linking a central office with branch offices,

telecommuters, and/or professionals on the road (travelers can connect to a VPN Gateway using any computer with VPN client software that supports IPSec, such as SSH Sentinel.)

There are two basic ways to create a VPN connection:

- VPN Gateway to VPN Gateway
- Computer (using VPN client software that supports IPSec) to VPN Gateway

The VPN Gateway creates a “tunnel” or channel between two endpoints, so that data transmissions between them are secure. A computer with VPN client software that supports IPSec can be one of the two endpoints. Any computer with the built-in IPSec Security Manager (Microsoft 2000 and XP) allows the VPN Gateway to create a VPN tunnel using IPSec (refer to “Appendix C: Configuring IPSec between a Windows 2000 or XP computer and the VPN Gateway”). Other versions of Microsoft operating systems require additional, third-party VPN client software applications that support IPSec to be installed.

Computer (using VPN client software that supports IPSec) to VPN Gateway

The following is an example of a computer-to-VPN Gateway VPN. (See Figure 2-2.) In her hotel room, a traveling businesswoman dials up her ISP. Her notebook computer has VPN client software that is configured with her office's VPN settings. She accesses the VPN client software that supports IPSec and connects to the VPN Gateway at the central office. As VPNs utilize the Internet, distance is not a factor. Using the VPN, the businesswoman now has a secure connection to the central office's network, as if she were physically connected.

VPN Gateway to VPN Gateway

An example of a VPN Gateway-to-VPN Gateway VPN would be as follows. (See Figure 2-3.) At home, a telecommuter uses his VPN Gateway for his always-on Internet connection. His Gateway is configured with his office's VPN settings. When he connects to his office's Gateway, the two Gateways create a VPN tunnel, encrypting and decrypting data. As VPNs utilize the Internet, distance is not a factor. Using the VPN, the telecommuter now has a secure connection to the central office's network, as if he were physically connected.

For additional information and instructions about creating your own VPN, please visit Linksys's international website at www.linksys.com/international or refer to “Appendix C: Configuring IPSec between a Windows 2000 or XP computer and the VPN Gateway.”

Why do I need a VPN?

Computer networking provides a flexibility not available when using a paper-based system. With this flexibility, however, comes an increased risk in security. This is why firewalls were first introduced. Firewalls help to



Figure 2-2: Computer-to-VPN Gateway



IMPORTANT: You must have at least one VPN Gateway on one end of the VPN tunnel. At the other end of the VPN tunnel, you must have a second VPN Gateway or a computer with VPN client software that supports IPSec.

protect data inside of a local network. But what do you do once information is sent outside of your local network, when emails are sent to their destination, or when you have to connect to your company's network when you are out on the road? How is your data protected?

That is when a VPN can help. VPNs secure data moving outside of your network as if it were still within that network.

When data is sent out across the Internet from your computer, it is always open to attacks. You may already have a firewall, which will help protect data moving around or held within your network from being corrupted or intercepted by entities outside of your network, but once data moves outside of your network - when you send data to someone via email or communicate with an individual over the Internet - the firewall will no longer protect that data.

At this point, your data becomes open to hackers using a variety of methods to steal not only the data you are transmitting but also your network login and security data. Some of the most common methods are as follows:

1) MAC Address Spoofing

Packets transmitted over a network, either your local network or the Internet, are preceded by a packet header. These packet headers contain both the source and destination information for that packet to transmit efficiently. A hacker can use this information to spoof (or fake) a MAC address allowed on the network. With this spoofed MAC address, the hacker can also intercept information meant for another user.

2) Data Sniffing

Data “sniffing” is a method used by hackers to obtain network data as it travels through unsecured networks, such as the Internet. Tools for just this kind of activity, such as protocol analyzers and network diagnostic tools, are often built into operating systems and allow the data to be viewed in clear text.

3) Man in the Middle Attacks

Once the hacker has either sniffed or spoofed enough information, he can now perform a “man in the middle” attack. This attack is performed, when data is being transmitted from one network to another, by rerouting the data to a new destination. Even though the data is not received by its intended recipient, it appears that way to the person sending the data.

These are only a few of the methods hackers use and they are always developing more. Without the security of your VPN, your data is constantly open to such attacks as it travels over the Internet. Data travelling over the Internet will often pass through many different servers around the world before reaching its final destination. That's a long way to go for unsecured data and this is when a VPN serves its purpose.

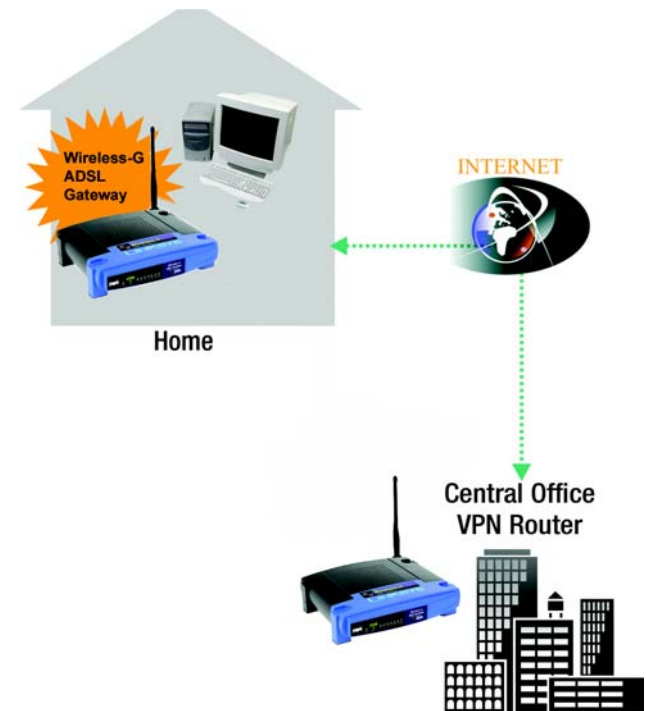


Figure 2-3: VPN Gateway-to-VPN Gateway

Chapter 3: Getting to Know the Wireless-G ADSL Gateway

The Back Panel

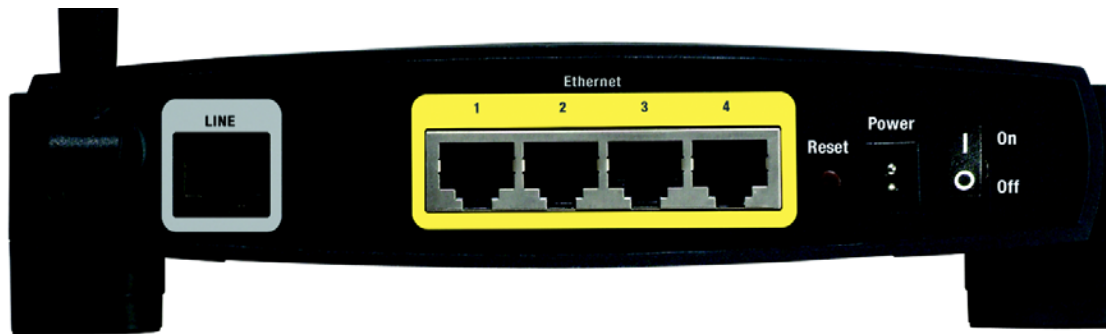


Figure 3-1: Back Panel

The Gateway's ports, where a network cable is connected, are located on the back panel. The Gateway's buttons are also located on the back panel.

- | | |
|-----------------------|--|
| LINE | The LINE port connects to the ADSL line. |
| Ethernet (1-4) | The Ethernet ports connect to your computer and other network devices. |
| Power | The Power port is where you will connect the power adapter. |
| Reset Button | There are two ways to Reset the Gateway's factory defaults. Either press the Reset Button , for approximately ten seconds, or restore the defaults from the Factory Defaults screen of the Administration tab in the Gateway's Web-Based Utility. |
| On/Off | This switch is used to turn the Gateway on or off. |

With these, and many other, Linksys products, your networking options are limitless. Go to the Linksys international website at www.linksys.com/international for more information about products that work with the Gateway.



Important: Resetting the Gateway to factory defaults will erase all of your settings (WEP Encryption, Wireless and LAN settings, etc.) and replace them with the factory defaults. Do not reset the Gateway if you want to retain these settings.

The Front Panel

The Gateway's LEDs, where information about network activity is displayed, are located on the front panel.



Figure 3-2: Front Panel

Power	Green. The Power LED lights up when the Gateway is powered on.
Ethernet (1-4)	Green. The LAN LED serves two purposes. If the LED is continuously lit, the Gateway is successfully connected to a device through the LAN port. If the LED is blinking, it is an indication of any network activity.
WLAN	Green. The WLAN LED lights up whenever there is a successful wireless connection. If the LED is blinking, the Gateway is actively sending or receiving data to or from one of the devices on the network.
DSL	Green. The DSL LED lights up whenever there is a successful DSL connection. The LED blinks while establishing the ADSL connection.
Internet	Green. The Internet LED lights up green when an Internet connection to the Internet Service Provider (ISP) session is established. The Internet LED lights up red when the connection to the ISP fails.

Chapter 4: Connecting the Wireless-G ADSL Gateway

Overview

The Gateway's setup consists of more than simply plugging hardware together. You will have to configure your networked computers to accept the IP addresses that the Gateway assigns them (if applicable), and you will also have to configure the Gateway with setting(s) provided by your Internet Service Provider (ISP).

The installation technician from your ISP should have left the setup information for your modem with you after installing your broadband connection. If not, you can call your ISP to request that data.

After you have the setup information you need for your specific type of Internet connection, you can begin installation and setup of the Gateway.

If you want to use a computer with an Ethernet adapter to configure the Gateway, continue to "Wired Connection to a computer." If you want to use a computer with a wireless adapter to configure the Gateway, continue to "Wireless Connection to a Computer."

Wired Connection to a Computer

1. Before you begin, make sure that all of your network's hardware is powered off, including the Gateway and all computers.
2. Connect one end of an Ethernet network cable to one of the Ethernet ports (labeled 1-4) on the back of the Gateway (see Figure 4-1), and the other end to an Ethernet port on a computer.
3. Repeat this step to connect more computers, a switch, or other network devices to the Gateway.



NOTE: A small device called a microfilter (not included) may be necessary between each phone and wall jack to prevent interference. Contact your ISP if you have any questions.



IMPORTANT: For countries that have phone jacks with RJ-11 connectors, make sure to only place the microfilters between the phone and the wall jack and **not** between the Modem and the wall jack or your ADSL will not connect.

For countries that do **not** have phone jacks with RJ-11 connectors (e.g. France, Sweden, Switzerland, United Kingdom, etc.), except for ISDN users, the microfilter has to be used between the modem and the wall jack, because the microfilter will have the RJ-11 connector.

Annex B users (E1 and DE versions of the Gateway) must use the included special cable to connect the gateway to the wall jack (RJ-45 to RJ-12). If you require splitters or special jacks, please contact your service provider.

4. Connect a phone cable from the Line port on the Gateway's back panel (see Figure 4-2) to the wall jack of the ADSL line. A small device called a microfilter may be necessary between each phone and wall jack to prevent interference. Contact your ISP if you have any questions.
5. Connect the power adapter to the Gateway's Power port (see Figure 4-3), and then plug the power adapter into a power outlet. Turn the On/Off switch to On.
 - The Power LED on the front panel will light up green as soon as the power adapter is connected properly and the switch is turned on. The Power LED will flash for a few seconds, then it will light up steady when the self-test is complete. If the LED flashes for one minute or longer, see "Appendix A: Troubleshooting."
6. Power on one of your computers that is connected to the Gateway.



Figure 4-1: Ethernet Connection

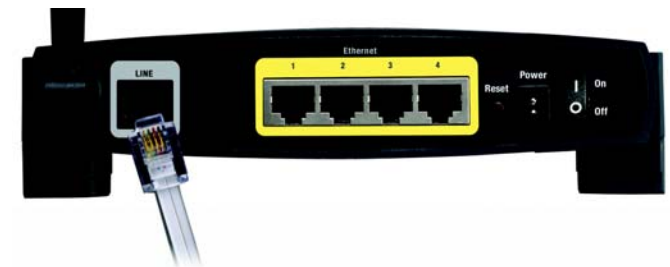


Figure 4-2: ADSL Connection



NOTE: You should always plug the Gateway's power adapter into a power strip with surge protection.

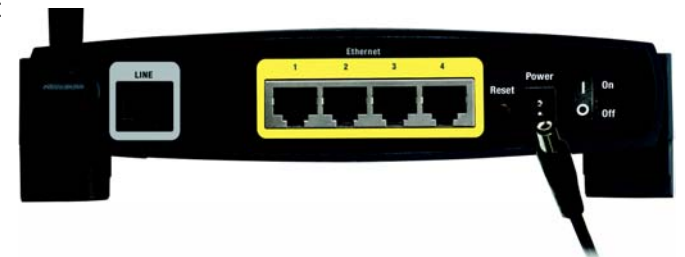


Figure 4-3: Power Connection

Wireless Connection to a Computer

If you want to use a wireless connection to access the Gateway, follow these instructions:

1. Before you begin, make sure that all of your network's hardware is powered off, including the Gateway and all computers.



NOTE: A small device called a microfilter (not included) may be necessary between each phone and wall jack to prevent interference. Contact your ISP if you have any questions.



IMPORTANT: For countries that have phone jacks with RJ-11 connectors, make sure to only place the microfilters between the phone and the wall jack and **not** between the Modem and the wall jack or your ADSL will not connect.

For countries that do **not** have phone jacks with RJ-11 connectors (e.g. France, Sweden, Switzerland, United Kingdom, etc.), except for ISDN users, the microfilter has to be used between the modem and the wall jack, because the microfilter will have the RJ-11 connector.

Annex B users (E1 and DE versions of the Gateway) must use the included special cable to connect the gateway to the wall jack (RJ-45 to RJ-12). If you require splitters or special jacks, please contact your service provider.



NOTE: You should always change the SSID from its default, linksys, and enable WEP encryption.

2. Connect a phone cable from the Line port on the Gateway's back panel to the wall jack of the ADSL line. A small device called a microfilter may be necessary between each phone and wall jack to prevent interference. Contact your ISP if you have any questions.
3. Connect the power adapter to the Power port, and then plug the power adapter into a power outlet. Turn the On/Off switch to On.
 - The Power LED on the front panel will light up green as soon as the power adapter is connected properly and the switch is turned on. The Power LED will flash for a few seconds, then light up steady when the self-test is complete. If the LED flashes for one minute or longer, see "Appendix A: Troubleshooting."
4. Power on one of the computers on your wireless network(s).
5. For initial access to the Gateway through a wireless connection, make sure the computer's wireless adapter has its SSID set to linksys (the Gateway's default setting), and its Wireless Security is disabled. After you have accessed the Gateway, you can change the Gateway and this computer's adapter settings to match the your usual network settings.

The Gateway's hardware installation is now complete.

Go to "Chapter 5: Configuring the Gateway."

Chapter 5: Configuring the Gateway

Overview

Follow the steps in this chapter and use the Gateway's web-based utility to configure the Gateway. This chapter will describe each web page in the Utility and each page's key functions. The utility can be accessed via your web browser through use of a computer connected to the Gateway. For a basic network setup, most users only have to use the following screens of the Utility:

- **Basic Setup.** On the Basic Setup screen, enter the settings provided by your ISP.
- **Management.** Click the **Administration** tab and then the **Management** tab. The Gateway's default username and password is admin. To secure the Gateway, change the Password from its default.

There are seven main tabs: Setup, Wireless, Security, Access Restrictions, Applications & Gaming, Administration, and Status. Additional tabs will be available after you click one of the main tabs.

Setup

- **Basic Setup.** Enter the Internet connection and network settings on this screen.
- **DDNS.** To enable the Gateway's Dynamic Domain Name System (DDNS) feature, complete the fields on this screen.
- **Advanced Routing.** On this screen, you can alter Dynamic Routing, and Static Routing configurations.

Wireless

- **Basic Wireless Settings.** You can choose your Wireless Network Mode and Wireless Security on this screen.
- **Wireless Network Access.** This screen displays your wireless network access list.
- **Advanced Wireless Settings.** On this screen you can access the Advanced Wireless features.

Security

- **Firewall.** This screen contains Filters and Block WAN Requests. Filters block specific internal users from accessing the Internet and block anonymous Internet requests.



Have You: Enabled TCP/IP on your computers? computers communicate over the network with this protocol. Refer to Windows Help for more information on TCP/IP.



Note: For added security, you should change the password through the Administration tab.

- **VPN.** To enable or disable IPSec and/or PPTP Pass-through, and set up VPN tunnels, use this screen.

Access Restrictions

- **Internet Access.** This screen allows you to prevent or permit only certain users from attaching to your network.

Applications & Gaming

- **Single Port Forwarding.** Use this screen to set up common services or applications on your network.
- **Port Range Forwarding.** To set up public services or other specialized Internet applications on your network, click this tab.
- **Port Triggering.** To set up triggered ranges and forwarded ranges for Internet applications, click this tab.
- **DMZ.** To allow one local user to be exposed to the Internet for use of special-purpose services, use this screen.

Administration

- **Management.** On this screen, alter Gateway access privileges, SNMP, UPnP, and WT-82 settings.
- **Reporting.** If you want to view or save activity logs, click this tab.
- **Diagnostics.** Use this screen to do a Ping Test.
- **Factory Defaults.** If you want to restore the Gateway's factory defaults, use this screen.
- **Firmware Upgrade.** Click this tab if you want to upgrade the Gateway's firmware.

Status

- **Gateway.** This screen provides status information about the Gateway.
- **Local Network.** This provides status information about the local network.
- **Wireless.** This screen provides status information about the wireless network.
- **DSL Connection.** This screen provides status information about the DSL connection.

How to Access the Web-based Utility

To access the web-based utility, launch Internet Explorer or Netscape Navigator, and enter the Gateway's default IP address, 192.168.1.1, in the Address field. Then press Enter.

A password request page, shown in Figure 5-1 will appear. (non-Windows XP users will see a similar screen.) Enter **admin** (the default user name) in the User Name field, and enter **admin** (the default password) in the Password field. Then click the **OK** button.

Figure 5-1: Password Screen

The Setup Tab

The Basic Setup Tab

The first screen that appears is the Basic Setup tab. This tab allows you to change the Gateway's general settings. Change these settings as described here and click the **Save Settings** button to save your changes or **Cancel Changes** to cancel your changes.

Internet Setup

- **PVC Connection.** Select a PVC connection number from the drop-down menu. Then, select the **Enable Now** to enable the connection.
- **VC Settings.** Virtual Circuits (VPI and VCI): These fields consist of two items: VPI (Virtual Path Identifier) and VCI (Virtual Channel Identifier). Your ISP will provide the correct settings for these fields.
 - **Multiplexing:** Select **LLC** or **VC**, depending on your ISP.
 - **QOS Type:** Select from the drop-down menu: **CBR**, Continuous Bit Rate to specify fixed bandwidth for voice or data traffic; **UBR**, Unspecific Bit Rate for application that are none-time sensitive, such as email; or **VBR**, Variable Bite Rate for Bursty traffic and bandwidth sharing with other application.
 - **Pcr Rate:** Peak Cell Rate, divide the DSL line rate by 424 to find the PCR to get the maximum rate the sender can send cells. Enter the rate in the field (if required by your service provider).
 - **Scr Rate:** Sustain Cell Rate, sets the average cell rate that can be transmitted. SCR normally less than PCR. Enter the rate in the field (if required by your service provider).
 - **Autodetect:** Select **Enable** to have the settings automatically entered or **Disable** to enter the values manually.

Figure 5-2: Basic Setup Tab

- **Virtual Circuit:** Enter the VPI and VCI ranges in the fields.
- **Internet Connection Type.** The Gateway supports five Encapsulations: RFC 1483 Bridged, RFC 1483 Routed, RFC 2516 PPPoE, RFC 2364 PPPoA, and Bridged Mode Only. Each Basic Setup screen and available features will differ depending on what type of encapsulation you select.

RFC 1483 Bridged

Dynamic IP

IP Settings. Select **Obtain an IP Address Automatically** if your ISP says you are connecting through a dynamic IP address.

Static IP

If you are required to use a permanent (static) IP address to connect to the Internet, then select **Use the following IP Address**.

- **Internet IP Address.** This is the Gateway's IP address, when seen from the WAN, or the Internet. Your ISP will provide you with the IP Address you need to specify here.
- **Subnet Mask.** This is the Gateway's Subnet Mask. Your ISP will provide you with the Subnet Mask.
- **Gateway.** Your ISP will provide you with the default Gateway Address, which is the ISP server's IP address.
- **Primary DNS. (Required) and Secondary DNS (Optional).** Your ISP will provide you with at least one DNS (Domain Name System) Server IP Address.

When finished making your changes on this tab, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes.

The screenshot shows the 'Internet Setup' tab with the 'PVC Connection' section expanded. Under 'Internet Connection Type', the 'VC Settings' section is active. The 'Encapsulation' is set to 'RFC1483 Bridged'. 'Multiplexing' has 'LLC' selected and 'VC' unselected. 'Qos Type' is set to 'UBR'. 'Pcr Rate' and 'Scr Rate' are both set to '0'. 'Autodetect' has 'Enable' selected and 'Disable' unselected. 'Virtual Circuit' shows 'VPI (Range 0-255)' and 'VCI (Range 1-65535)' both set to '0'. In the 'IP Settings' section, 'Obtain an IP Address Automatically' is selected, and 'Use the following IP Address:' is unselected. Below this, fields for 'Internet IP Address', 'Subnet Mask', 'Gateway', 'Primary DNS', and 'Secondary DNS' are all set to '0.0.0.0'.

Figure 5-3: Dynamic IP

This screenshot is identical to the one for Figure 5-3, showing the 'Internet Setup' tab with 'Obtain an IP Address Automatically' selected. However, in this version, the 'Use the following IP Address:' radio button is selected, and the fields for 'Internet IP Address', 'Subnet Mask', 'Gateway', 'Primary DNS', and 'Secondary DNS' are all set to '0.0.0.0'.

Figure 5-4: Static IP

RFC 1483 Routed

If you are required to use RFC 1483 Routed, then select **RFC 1483 Routed**.

- **IP Address.** This is the Gateway's IP address, when seen from the WAN, or the Internet. Your ISP will provide you with the IP Address you need to specify here.
- **Subnet Mask.** This is the Gateway's Subnet Mask. Your ISP will provide you with the Subnet Mask.
- **Default Gateway.** Your ISP will provide you with the Default Gateway Address, which is the ISP server's IP address.
- **Primary DNS. (Required) and Secondary DNS (Optional).** Your ISP will provide you with at least one DNS (Domain Name System) Server IP Address.

RFC 2516 PPPoE

Some DSL-based ISPs use PPPoE (Point-to-Point Protocol over Ethernet) to establish Internet connections. If you are connected to the Internet through a DSL line, check with your ISP to see if they use PPPoE. If they do, you will have to enable PPPoE.

- **Service Name.** Enter the name of your PPPoE service in the field.
- **User Name and Password.** Enter the User Name and Password provided by your ISP.
- **Connect on Demand: Max Idle Time.** You can configure the Gateway to disconnect the Internet connection after it has been inactive for a specified period of time (Max Idle Time). If your Internet connection has been terminated due to inactivity, Connect on Demand enables the Gateway to automatically re-establish your connection as soon as you attempt to access the Internet again. If you wish to activate **Connect on Demand**, click the radio button. In the Max Idle Time field, enter the number of minutes you want to have elapsed before your Internet connection terminates.
- **Keep Alive: Redial Period.** If you select this option, the Gateway will periodically check your Internet connection. If you are disconnected, then the Gateway will automatically re-establish your connection. To use this option, click the radio button next to **Keep Alive**. In the Redial Period field, you specify how often you want the Gateway to check the Internet connection. The default Redial Period is 30 seconds.

To use a second PPPoE, enable **Second PPPoE** from the drop-down menu. Enter the Service Name, User Name, Password, Connect on Demand, and Keep Alive. Enter the domain name in the **Match Domain Name** field.

The screenshot shows the 'Internet Setup' tab with the 'PVC Connection' section selected. Under 'Internet Connection Type', 'VC Settings' are visible. The configuration is for 'RFC 1483 Routed'. The 'Please Select a Connection' dropdown is set to '1'. 'Enable Now' is checked. 'Encapsulation' is set to 'RFC 1483 Routed'. 'Multiplexing' has radio buttons for 'LLC' (selected) and 'VC'. 'Qos Type' is set to 'UBR'. 'Pcr Rate' and 'Scr Rate' are both set to '0'. 'Autodetect' has radio buttons for 'Enable' (selected) and 'Disable'. 'Virtual Circuit' is set to '0' for both VPI (Range 0~255) and VCI (Range 1~65535). Under 'IP Settings', the following fields are visible: Internet IP Address (0.0.0.0), Subnet Mask (0.0.0.0), Gateway (0.0.0.0), Primary DNS (0.0.0.0), and Secondary DNS (0.0.0.0).

Figure 5-5: RFC 1483 Routed

The screenshot shows the 'Internet Setup' tab with the 'PVC Connection' section selected. Under 'Internet Connection Type', 'VC Settings' and 'PPPoE Settings' are visible. The configuration is for 'RFC 2516 PPPoE'. The 'Please Select a Connection' dropdown is set to '1'. 'Enable Now' is checked. 'Encapsulation' is set to 'RFC 2516 PPPoE'. 'Multiplexing' has radio buttons for 'LLC' (selected) and 'VC'. 'Qos Type' is set to 'UBR'. 'Pcr Rate' and 'Scr Rate' are both set to '0' cps. 'Autodetect' has radio buttons for 'Enable' and 'Disable' (selected). 'Virtual Circuit' is set to '0' for VPI (Range 0~255) and '35' for VCI (Range 1~65535). Under 'PPPoE Settings', the following fields are visible: Service Name (empty), User Name (empty), Password (empty), 'Connect on Demand: Max Idle Time' (20 Min) with the radio button selected, and 'Keep Alive: Redial Period' (20 Sec) with the radio button unselected. Below this, 'Second PPPoE' is set to 'Enable'. Under 'Second PPPoE', the following fields are visible: Service Name (empty), User Name (empty), Password (empty), Match Domain Name (empty), 'Connect on Demand: Max Idle Time' (20 Min) with the radio button selected, and 'Keep Alive: Redial Period' (20 Sec) with the radio button unselected.

Figure 5-6: RFC 2516 PPPoE

When finished making your changes on this tab, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes.

RFC 2364 PPPoA

Some DSL-based ISPs use PPPoA (Point-to-Point Protocol over ATM) to establish Internet connections. If you are connected to the Internet through a DSL line, check with your ISP to see if they use PPPoA. If they do, you will have to enable PPPoA.

- **User Name and Password.** Enter the User Name and Password provided by your ISP.
- **Connect on Demand: Max Idle Time.** You can configure the Gateway to cut the Internet connection after it has been inactive for a specified period of time (Max Idle Time). If your Internet connection has been terminated due to inactivity, Connect on Demand enables the Gateway to automatically re-establish your connection as soon as you attempt to access the Internet again. If you wish to activate **Connect on Demand**, click the radio button. In the Max Idle Time field, enter the number of minutes you want to have elapsed before your Internet connection terminates.
- **Keep Alive Option: Redial Period.** If you select this option, the Gateway will periodically check your Internet connection. If you are disconnected, then the Gateway will automatically re-establish your connection. To use this option, click the radio button next to **Keep Alive**. In the Redial Period field, you specify how often you want the Gateway to check the Internet connection. The default Redial Period is 30 seconds.

When finished making your changes on this tab, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes.

Bridged Mode Only

If you are using your Gateway as a bridge, which makes the Gateway act like a standalone modem, select **Bridged Mode Only**. All NAT and routing is disabled in this mode.

When finished making your changes on this tab, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes.

The screenshot shows the 'Internet Setup' tab with the 'PVC Connection' section selected. Under 'Internet Connection Type', 'VC Settings' is expanded. The 'Encapsulation' is set to 'RFC 2364 PPPoA'. 'Multiplexing' has 'LLC' selected. 'Qos Type' is 'UBR'. 'Pcr Rate' and 'Scr Rate' are both 0. 'Autodetect' is 'Enable'. 'Virtual Circuit' is 0. 'User Name' and 'Password' fields are empty. 'Connect on Demand: Max Idle Time' is 3 minutes. 'Keep Alive: Redial Period' is 20 seconds.

Figure 5-7: RFC 2364 PPPoA

The screenshot shows the 'Internet Setup' tab with the 'PVC Connection' section selected. Under 'Internet Connection Type', 'VC Settings' is expanded. The 'Encapsulation' is set to 'Bridged Mode Only'. 'Multiplexing' has 'LLC' selected. 'Qos Type' is 'UBR'. 'Pcr Rate' and 'Scr Rate' are both 0. 'Autodetect' is 'Enable'. 'Virtual Circuit' is 0. 'User Name' and 'Password' fields are empty. 'Connect on Demand: Max Idle Time' is 3 minutes. 'Keep Alive: Redial Period' is 20 seconds.

Figure 5-8: Bridged Mode Only

Optional Settings (Required by some ISPs)

- **Host Name and Domain Name.** These fields allow you to supply a host and domain name for the Gateway. Some ISPs require these names as identification. You may have to check with your ISP to see if your broadband Internet service has been configured with a host and domain name. In most cases, leaving these fields blank will work.
- **MTU.** The MTU (Maximum Transmission Unit) setting specifies the largest packet size permitted for network transmission. Select **Manual** and enter the value desired in the *Size* field. It is recommended that you leave this value in the 1200 to 1500 range. By default, MTU is configured automatically.

Network Setup

- **Router IP.** The values for the Gateway's Local IP Address and Subnet Mask are shown here. In most cases, keeping the default values will work.
 - **Local IP Address.** The default value is 192.168.1.1.
 - **Subnet Mask.** The default value is 255.255.255.0.
- **Network Address Server Settings (DHCP).** A Dynamic Host Configuration Protocol (DHCP) server automatically assigns an IP address to each computer on your network for you. Unless you already have one, it is highly recommended that you leave the Gateway enabled as a DHCP server.
 - **DHCP Server.** If you enable the DHCP Server or DHCP Relay for the Local DHCP server, enter the IP address for the DHCP server in the fields. Click the **Advanced** button to reserve a specific IP address to be assigned to a specific MAC address (up to 10 entries) and a host name to a specific IP address (up to 10 entries).
 - **Starting IP Address.** Enter a value for the DHCP server to start with when issuing IP addresses. This value must be 192.168.1. 2 or greater, because the default IP address for the Gateway is 192.168.1.1.
 - **Maximum Number of DHCP Users.** Enter the maximum number of users/clients that can obtain an IP address. The number will vary depending on the starting IP address entered.
 - **Client Lease Time.** The Client Lease Time is the amount of time a network user will be allowed connection to the Gateway with their current dynamic IP address. Enter the amount of time, in minutes, that the user will be "leased" this dynamic IP address.
 - **Static DNS 1-3.** The Domain Name System (DNS) is how the Internet translates domain or website names into Internet addresses or URLs. Your ISP will provide you with at least one DNS Server IP Address. You

Optional Settings (required by some ISPs)

Host Name:

Domain Name:

MTU:

Size:

Network Setup

Router IP

Local IP Address: . . .

Subnet Mask: . . .

Network Address Server Settings (DHCP)

Local DHCP Server: ☒ Enable ☐ Disable ☐ DHCP Relay

DHCP Server: . . . **Advanced**

Starting IP Address: . . .

Maximum Number of DHCP Users:

Client Lease Time: minutes (0 means one day)

Static DNS 1: . . .

Static DNS 2: . . .

Static DNS 3: . . .

WINS: . . .

Time Setting

Time Zone:

☒ Automatically adjust clock for daylight saving changes

Figure 5-9: Optional Settings

can enter up to three DNS Server IP Addresses here. The Router will use these for quicker access to functioning DNS servers.

- **WINS.** The Windows Internet Naming Service (WINS) converts NetBIOS names to IP addresses. If you use a WINS server, enter that server's IP address here. Otherwise, leave this field blank.
- **Time Setting.** This is where you set the time zone for your Gateway. Select your time zone from the drop-down menu. If desired, check the **Automatically adjust clock for daylight saving changes**.

When finished making your changes on this tab, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes.

The DDNS Tab

The Gateway offers a Dynamic Domain Name System (DDNS) feature. DDNS lets you assign a fixed host and domain name to a dynamic Internet IP address. It is useful when you are hosting your own website, FTP server, or other server behind the Gateway.

Before you can use this feature, you need to sign up for DDNS service at DynDNS.org.

DDNS

DDNS Service. If your DDNS service is provided by DynDNS.org, then select **DynDNS.org** in the drop-down menu. (See Figure 5-10.) To disable DDNS Service, select **Disabled**.

DynDNS.org

- **User Name, Password, and Host Name.** Enter the User Name, Password, and Host Name of the account you set up with DynDNS.org.
- **Internet IP Address.** The Gateway's current Internet IP Address is displayed here. Because it is dynamic, it will change.
- **Status.** The status of the DDNS service connection is displayed here.

TZO.com

- **Email Address, Password, and Domain Name.** Enter the Email Address, TZO Password Key, and Domain Name of the service you set up with TZO.



Figure 5-10: DynDNS.org



Figure 5-11: TZO.com

- **Internet IP Address.** The Router's current Internet IP Address is displayed here. Because it is dynamic, this will change.
- **Status.** The status of the DDNS service connection is displayed here.

When finished making your changes on this tab, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes.

Advanced Routing Tab

The Advanced Routing screen allows you to configure the dynamic routing and static routing settings.

Advanced Routing

- **Operating Mode.** NAT is a security feature that is enabled by default. It enables the Gateway to translate IP addresses of your local area network to a different IP address for the Internet. To disable NAT, click the **Disabled** radio button.
- **Dynamic Routing.** With Dynamic Routing you can enable the Gateway to automatically adjust to physical changes in the network's layout. The Gateway, using the RIP protocol, determines the network packets' route based on the fewest number of hops between the source and the destination. The RIP protocol regularly broadcasts routing information to other Gateways on the network. To enable RIP, click **Enabled**. To disable RIP, click **Disabled**.
 - **Transmit RIP Version.** To transmit RIP messages, select the protocol you want: **RIP1**, **RIP1-Compatible**, or **RIP2**. If you don't want to transmit RIP messages, select **None**.
 - **Receive RIP Version.** To receive RIP messages, select the protocol you want: **RIP1** or **RIP2**. If you don't want to receive RIP messages, select **None**.
- **Static Routing.** If the Gateway is connected to more than one network, it may be necessary to set up a static route between them. A static route is a pre-determined pathway that network information must travel to reach a specific host or network. To create a static route, change the following settings:
 - **Select set number.** Select the number of the static route from the drop-down menu. The Gateway supports up to 20 static route entries. If you need to delete a route, after selecting the entry, click the **Delete This Entry** button.
 - **Destination IP Address.** The Destination IP Address is the address of the remote network or host to which you want to assign a static route. Enter the IP address of the host for which you wish to create a static

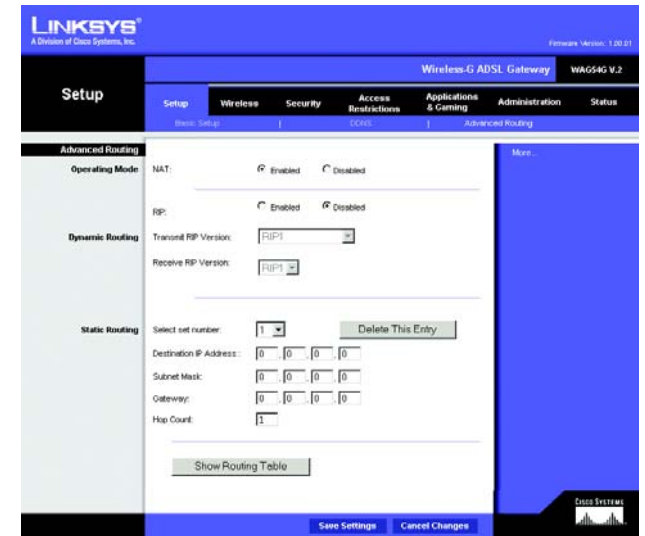


Figure 5-12: Advanced Routing

route. If you are building a route to an entire network, be sure that the network portion of the IP address is set to 0.

- **Subnet Mask.** The Subnet Mask (also known as the Network Mask) determines which portion of an IP address is the network portion, and which portion is the host portion.
- **Gateway.** This IP address should be the IP address of the gateway device that allows for contact between the Gateway and the remote network or host.
- **Hop Count.** Hop Count is the number of hops to each node until the destination is reached (16 hops maximum). Enter the Hop Count in the field.
- **Show Routing Table.** Click the **Show Routing Table** button to open a screen displaying how data is routed through your LAN. For each route, the Destination IP address, Subnet Mask, Gateway, and Interface are displayed. Click the **Refresh** button to update the information. Click the **Close** button to return to the previous screen.

When finished making your changes on this tab, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes.

Routing Table Entry List Refresh

Destination LAN IP	Subnet Mask	Gateway	Interface
192.168.1.0	255.255.255.0	0.0.0.0	LAN & Wireless

Close

Figure 5-13: Routing Table

The Wireless Tab

Basic Wireless Settings Tab

This screen allows you to choose your wireless network mode and wireless security.

Wireless Network

- **Wireless Network Mode.** If you have 802.11g and 802.11b devices in your network, then keep the default setting, **Mixed**. If you have only 802.11g devices, select **802.11g**. If you have only 802.11b devices, select **802.11b**. If you want to disable wireless networking, select **Disabled**.
- **Wireless Network Name (SSID).** Enter the name for your wireless network into the field. The SSID is the network name shared among all devices in a wireless network. The SSID must be identical for all devices in the wireless network. It is case-sensitive and must not exceed 32 alphanumeric characters, which may be any keyboard character. Linksys recommends that you change the default SSID (linksys) to a unique name of your choice.
- **Wireless Channel.** Select the appropriate channel from the list provided to correspond with your network settings, between 1 and 11 (in North America). All devices in your wireless network must use the same channel in order to function correctly. Linksys wireless clients will automatically detect the wireless channel of the Gateway.
- **Wireless SSID Broadcast.** When wireless clients survey the local area for wireless networks to associate with, they will detect the SSID broadcast by the Router. To broadcast the Router's SSID, keep the default setting, **Enable**. If you do not want to broadcast the Router's SSID, then select **Disable**.

When finished making your changes on this tab, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes.



Figure 5-14: Wireless Network Mode

Wireless Security Tab

The Wireless Security settings configure the security of your wireless network. There are three wireless security mode options supported by the Gateway: WPA Pre-Shared Key, WPA RADIUS, and WEP. (WPA stands for Wi-Fi Protected Access, which is a security standard stronger than WEP encryption. WEP stands for Wired Equivalent Privacy, while RADIUS stands for Remote Authentication Dial-In User Service.) These are briefly discussed here. For detailed instructions on configuring wireless security for the Gateway, turn to “Appendix B: Wireless Security.” If you want to disable wireless security, select Disable from the drop-down menu for Security Mode.

WPA Pre-Shared Key. Enter a WPA Shared Key of 8-32 characters. Then enter a Group Key Renewal period, which instructs the Gateway how often it should change the encryption keys.



Figure 5-15: WPA Pre-Shared Key

WPA RADIUS. This option features WPA used in coordination with a RADIUS server. (This should only be used when a RADIUS server is connected to the Gateway.) Enter the RADIUS server's IP Address and port number, along with a key shared between the Gateway and the server. Then, enter a Key Renewal Timeout, which instructs the Gateway how often it should change the encryption keys.



Figure 5-16: WPA RADIUS

WEP. WEP is a basic encryption method, which is not as secure as WPA. To use WEP, select a Default Key (choose which Key to use), and a level of WEP encryption, **64 bits 10 hex digits** or **128 bits 26 hex digits**. Then either generate a WEP key using a Passphrase or enter the WEP key manually.

- **WEP Encryption.** An acronym for Wired Equivalent Privacy, WEP is an encryption method used to protect your wireless data communications. WEP uses 64-bit or 128-bit keys to provide access control to your network and encryption security for every data transmission. To decode data transmissions, all devices in a network must use an identical WEP key. Higher encryption levels offer higher levels of security, but due to the complexity of the encryption, they may decrease network performance. To enable WEP, select **64 bits (10 hex digits)** or **128 bits (26 hex digits)**.
- **Default Transmit Key** Select which WEP key (1-4) will be used when the Gateway sends data. Make sure that the receiving device (wireless client) is using the same key.
- **Passphrase.** Instead of manually entering WEP keys, you can enter a passphrase. This passphrase is used to generate one or more WEP keys. It is case-sensitive and should not be longer than 32 alphanumeric characters. (This Passphrase function is compatible with Linksys wireless products only and cannot be used with Windows XP Zero Configuration. If you want to communicate with non-Linksys wireless products or Windows XP Zero Configuration, make a note of the WEP key generated in the Key 1 field, and enter it manually in the wireless client.) After you enter the Passphrase, click the **Generate** button to create WEP keys.
- **WEP Keys 1-4.** WEP keys enable you to create an encryption scheme for wireless network transmissions. If you are not using a Passphrase, then manually enter a set of values. (Do not leave a key field blank, and do not enter all zeroes; they are not valid key values.) If you are using 64-bit WEP encryption, the key must be exactly 10 hexadecimal characters in length. If you are using 128-bit WEP encryption, the key must be exactly 26 hexadecimal characters in length. Valid hexadecimal characters are “0”-“9” and “A”-“F”.

When finished making your changes on this tab, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes. For detailed instructions on configuring wireless security for the Gateway, turn to “Appendix B: Wireless Security.”



Figure 5-17: WEP

Wireless Access Tab

Wireless Network Access

Wireless Network Access. If you select **Allow All**, all computers will be allowed access to the wireless network. To restrict access to the network, select **Restrict Access**, then select **Prevent** to prevent access or **Permit only** to permit access. Click the **Edit MAC Address Access List** button, and the screen will appear.

Select the MAC Address from the list and click **Wireless Client MAC List**.

When finished making your changes on this tab, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes.



Figure 5-18: Wireless Network Access

 This screenshot shows the 'MAC Address Filter List' configuration page. It has a title 'MAC Address Filter List' and a subtitle 'Enter MAC Address Format: xxxxxxxxxxxx/xxxxxxxxxxxx'. Below this is a table with 20 rows, each containing a label (MAC 01 through MAC 20) and an empty text input field. At the bottom of the table is a button labeled 'Wireless Client MAC List'. Below the entire form area are 'Save Settings' and 'Cancel Changes' buttons.

Figure 5-19: MAC Address Access/Filter List

Advanced Wireless Settings Tab

Advanced Wireless

On this screen you can access the Advanced Wireless features, including Authentication Type, Basic Data Rates, Control Tx Rates, Beacon Interval, DTIM Interval, RTS Threshold, and Fragmentation Threshold.

- **Authentication Type.** The default is set to Auto (default), which allows either Open System or Shared Key authentication to be used. For Open System authentication, the sender and the recipient do not use a WEP key for authentication but can use WEP for data encryption. If you want to allow on Open System authentication, then select **Open System**. For Shared Key authentication, the sender and recipient use a WEP key for both authentication and data encryption. If you want to use only Shared Key authentication, then select **Shared Key**. It is recommended that this option be left in the default (Auto) mode, because some clients cannot be configured for Shared Key.
- **Control Tx Rates.** The default transmission rate is Auto. The range is from 1 to 54Mbps. The rate of data transmission should be set depending on the speed of your wireless network. You can select from a range of transmission speeds, or keep the default setting, **Auto**, to have the Gateway automatically use the fastest possible data rate and enable the Auto-Fallback feature. Auto-Fallback will negotiate the best possible connection speed between the Gateway and a wireless client.
- **Beacon Interval.** The default value is 100. Enter a value between 1 and 65,535 milliseconds. The Beacon Interval value indicates the frequency interval of the beacon. A beacon is a packet broadcast by the Gateway to synchronize the wireless network.
- **DTIM Interval.** The default value is 3. This value, between 1 and 255, indicates the interval of the Delivery Traffic Indication Message (DTIM). A DTIM field is a countdown field informing clients of the next window for listening to broadcast and multicast messages. When the Gateway has buffered broadcast or multicast messages for associated clients, it sends the next DTIM with a DTIM Interval value. Its clients hear the beacons and awaken to receive the broadcast and multicast messages.
- **Fragmentation Threshold.** This value should remain at its default setting of 2346. The range is 256-2346 bytes. It specifies the maximum size for a packet before data is fragmented into multiple packets. If you experience a high packet error rate, you may slightly increase the Fragmentation Threshold. Setting the Fragmentation Threshold too low may result in poor network performance. Only minor modifications of this value are recommended.
- **RTS Threshold.** This value should remain at its default setting of 2347. The range is 0-2347 bytes. If you encounter inconsistent data flow, only minor modifications are recommended. If a network packet is smaller than the preset RTS threshold size, the RTS/CTS mechanism will not be enabled. The Gateway sends Request to Send (RTS) frames to a particular receiving station and negotiates the sending of a data frame. After



Figure 5-20: Advanced Wireless Settings

receiving an RTS, the wireless station responds with a Clear to Send (CTS) frame to acknowledge the right to begin transmission.

The Security Tab

Firewall

When you click the Security tab, you will see the Firewall screen. This screen contains Filters and the option to Block WAN Requests. Filters block specific Internet data types and block anonymous Internet requests. To add Firewall Protection, click **Enable**. If you do not want Firewall Protection, click **Disable**.

Additional Filters

- Filter Proxy. Use of WAN proxy servers may compromise the Gateway's security. Denying Filter Proxy will disable access to any WAN proxy servers. To enable proxy filtering, click **Enabled**.
- Filter Cookies. A cookie is data stored on your computer and used by Internet sites when you interact with them. To enable cookie filtering, click **Enabled**.
- Filter Java Applets. Java is a programming language for websites. If you deny Java Applets, you run the risk of not having access to Internet sites created using this programming language. To enable Java Applet filtering, click **Enabled**.
- Filter ActiveX. ActiveX is a programming language for websites. If you deny ActiveX, you run the risk of not having access to Internet sites created using this programming language. To enable ActiveX filtering, click **Enabled**.

Block WAN requests

- Block Anonymous Internet Requests. This keeps your network from being “pinged” or detected and reinforces your network security by hiding your network ports, so it is more difficult for intruders to discover your network. Select **Block Anonymous Internet Requests** to block anonymous Internet requests or de-select it to allow anonymous Internet requests.

When finished making your changes on this tab, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes.



Figure 5-21: Firewall

VPN

Virtual Private Networking (VPN) is a security measure that basically creates a secure connection between two remote locations. The VPN screen allows you to configure your VPN settings to make your network more secure.

VPN Passthrough

- **IPSec Passthrough.** Internet Protocol Security (IPSec) is a suite of protocols used to implement secure exchange of packets at the IP layer. To allow IPSec Passthrough, click the **Enable** button. To disable IPSec Passthrough, click the **Disable** button.
- **PPTP Passthrough.** Point-to-Point Tunneling Protocol Passthrough is the method used to enable VPN sessions to a Windows NT 4.0 or 2000 server. To allow PPTP Passthrough, click the **Enable** button. To disable PPTP Passthrough, click the **Disable** button.
- **L2TP Passthrough.** Layering 2 Tunneling Protocol Passthrough is an extension of the Point-to-Point Tunneling Protocol (PPTP) used to enable the operation of a VPN over the Internet. To allow L2TP Passthrough, click the **Enable** button. To disable L2TP Passthrough, click the **Disable** button.

IPSec VPN Tunnel

The VPN Gateway creates a tunnel or channel between two endpoints, so that the data or information between these endpoints is secure.

- To establish this tunnel, select the tunnel you wish to create in the Select Tunnel Entry drop-down box. It is possible to create up to five simultaneous tunnels. Then click **Enabled** to enable the IPSec VPN tunnel. Once the tunnel is enabled, enter the name of the tunnel in the Tunnel Name field. This is to allow you to identify multiple tunnels and does not have to match the name used at the other end of the tunnel. To delete a tunnel entry, select the tunnel, then click **Delete**. To view a summary of the settings, click **Summary**.
- **Local Secure Group and Remote Secure Group.** The Local Secure Group is the computer(s) on your LAN that can access the tunnel. The Remote Secure Group is the computer(s) on the remote end of the tunnel that can access the tunnel. These computers can be specified by a Subnet, specific IP address, or range.
- **Local Security Gateway.**
- **Remote Security Gateway.** The Remote Security Gateway is the VPN device, such as a second VPN Gateway, on the remote end of the VPN tunnel. Enter the IP Address or Domain of the VPN device at the other end of the tunnel. The remote VPN device can be another VPN Gateway, a VPN Server, or a computer with VPN client software that supports IPSec. The IP Address may either be static (permanent) or dynamic (changing), depending on the settings of the remote VPN device. Make sure that you have entered the IP Address

The screenshot shows the Linksys VPN configuration interface. On the left is a sidebar with 'Security' selected, containing links for 'VPN Passthrough', 'IPSec VPN Tunnel', 'Local Secure Group', 'Local Security Gateway', 'Remote Secure Group', 'Remote Security Gateway', 'Key Management', and 'Status'. The main area is titled 'VPN' and contains several sections: 'VPN Passthrough' with enable/disable buttons for IPSec, PPTP, and L2TP; 'IPSec VPN Tunnel' with a 'Select Tunnel Entry' dropdown, 'Delete' and 'Summary' buttons, and fields for 'Tunnel Name', 'Local Secure Group' (Subnet/IP/Mask), 'Local Security Gateway' (conn:1 - 0.0.0.0 - Down), 'Remote Secure Group' (Subnet/IP/Mask), 'Remote Security Gateway' (IP Address), 'Encryption' (DES), 'Authentication' (MD5), 'Key Management' (Auto (IKE) with Enabled/Disabled buttons, Pre-shared Key, Key Lifetime), and a 'Status' section showing 'Disconnected' with 'Connect', 'View Logs', and 'Advanced Settings' buttons. At the bottom are 'Save Settings' and 'Cancel Changes' buttons.

Figure 5-22: VPN

The screenshot shows the 'VPN Settings Summary' page. It features a table with the following columns: 'No.', 'Tunnel Name', 'Status', 'Local Group', 'Remote Group', 'Remote Gateway', and 'Security Method'. Above the table, it displays 'WAN IP: 0.0.0.0'. A 'Refresh' button is located in the top right corner.

No.	Tunnel Name	Status	Local Group	Remote Group	Remote Gateway	Security Method

Figure 5-23: VPN Settings Summary

correctly, or the connection cannot be made. Remember, this is NOT the IP Address of the local VPN Gateway, but the IP Address of the remote VPN Gateway or device with which you wish to communicate. If you enter an IP address, only the specific IP Address will be able to access the tunnel. If you select **Any**, any IP Address can access the tunnel.

- **Encryption.** Using Encryption also helps make your connection more secure. There are two different types of encryption: DES or 3DES (3DES is recommended because it is more secure). You may choose either of these, but it must be the same type of encryption that is being used by the VPN device at the other end of the tunnel. Or, you may choose not to encrypt by selecting Disable. In Figure 5-19, DES (which is the default) has been selected.
- **Authentication.** Authentication acts as another level of security. There are two types of authentication: MD5 and SHA (SHA is recommended because it is more secure). As with encryption, either of these may be selected, if the VPN device at the other end of the tunnel is using the same type of authentication. Or, both ends of the tunnel may choose to Disable authentication. In the Manual Key Management screen, MD5 (the default) has been selected.
- **Key Management.** Select **Auto (IKE)** or **Manual** from the drop-down menu. The two methods are described below.

Auto (IKE)

Select **Auto (IKE)** and enter a series of numbers or letters in the Pre-shared Key field. Based on this word, which **MUST** be entered at both ends of the tunnel if this method is used, a key is generated to scramble (encrypt) the data being transmitted over the tunnel, where it is unscrambled (decrypted). You may use any combination of up to 24 numbers or letters in this field. No special characters or spaces are allowed. In the Key Lifetime field, you may select to have the key expire at the end of a time period. Enter the number of seconds you'd like the key to be useful, or leave it blank for the key to last indefinitely. Check the box next to PFS (Perfect Forward Secrecy) to ensure that the initial key exchange and IKE proposals are secure.

Manual

Select **Manual**, then select the Encryption Algorithm from the drop-down menu. Enter the Encryption Key in the field (if you chose DES for your Encryption Algorithm, enter 16 hexadecimal characters, if you chose 3DES, enter 48 hexadecimal characters). Select the Authentication Algorithm from the drop-down menu. Enter the Authentication Key in the field (if you chose MD5 for your Authentication Algorithm, enter 32 hexadecimal characters, if you chose SHA1, enter 40 hexadecimal characters). Enter the Inbound and Outbound SPIs in the respective fields.

- **Status.** The status of the connection is shown.

Click the **Connect** button to connect your VPN tunnel. Click **View Logs** to view system, UPnP, VPN, firewall, access, or all logs. Click the **Advanced Settings** button and the Advanced IPsec VPN Tunnel Setup screen will appear.

The screenshot shows the 'Security' tab of the Linksys WAG54G V2 gateway. The 'Manual Key Management' section is selected. It displays the following settings:

- VPN PassThrough:** IPsec, PPTP, L2TP (all set to 'Enable').
- IPsec VPN Tunnel:** Tunnel Name is empty, IPsec VPN Tunnel is 'Enabled'.
- Local Secure Group:** IP: 0.0.0.0, Mask: 255.255.255.0.
- Remote Secure Group:** IP: 0.0.0.0, Mask: 255.255.255.0.
- Key Management:** Method is 'Manual'. Encryption is 'DES', Authentication is 'MD5'. Encryption Key and Authentication Key fields are empty. Inbound SPI and Outbound SPI fields are empty.
- Status:** Disconnected.

Figure 5-24: Manual Key Management

The screenshot shows the 'System Log' screen. It features a table with the following columns: Time, Message, and Action. The table is currently empty. Below the table are buttons for 'Clear', 'pageRefresh', 'Previous Page', and 'Next Page'. There is also a 'Clear' button and a 'pageRefresh' button at the top right of the log area.

Figure 5-25: System Log

When finished making your changes on this tab, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes.

Advanced VPN Tunnel Setup

From the Advanced IPsec VPN Tunnel Setup screen you can adjust the settings for specific VPN tunnels.

Phase 1

- **Phase 1** is used to create a security association (SA), often called the IKE SA. After Phase 1 is completed, Phase 2 is used to create one or more IPsec SAs, which are then used to key IPsec sessions.
- **Operation Mode.** There are two modes: Main and Aggressive, and they exchange the same IKE payloads in different sequences. Main mode is more common; however, some people prefer Aggressive mode because it is faster. Main mode is for normal usage and includes more authentication requirements than Aggressive mode. Main mode is recommended because it is more secure. No matter which mode is selected, the VPN Gateway will accept both Main and Aggressive requests from the remote VPN device.
- **Encryption.** Select the length of the key used to encrypt/decrypt ESP packets. There are two choices: DES and 3DES. 3DES is recommended because it is more secure.
- **Authentication.** Select the method used to authenticate ESP packets. There are two choices: MD5 and SHA. SHA is recommended because it is more secure.
- **Group.** There are two Diffie-Hellman Groups to choose from: 768-bit and 1024-bit. Diffie-Hellman refers to a cryptographic technique that uses public and private keys for encryption and decryption.
- **Key Life Time.** In the Key Lifetime field, you may optionally select to have the key expire at the end of a time period of your choosing. Enter the number of seconds you'd like the key to be used until a re-key negotiation between each endpoint is completed.

Phase 2

- **Encryption.** The encryption method selected in Phase 1 will be displayed.
- **Authentication.** The authentication method selected in Phase 1 will be displayed.
- **PFS.** The status of PFS will be displayed.
- **Group.** There are two Diffie-Hellman Groups to choose from: 768-bit and 1024-bit. Diffie-Hellman refers to a cryptographic technique that uses public and private keys for encryption and decryption.

The screenshot shows the 'Advanced IPsec VPN Tunnel Setup' window. The title bar is blue with the text 'Advanced IPsec VPN Tunnel Setup'. The main content area is white and contains settings for 'Tunnel 1'. Under 'Phase 1:', 'Operation mode' has radio buttons for 'Main mode' (selected) and 'Aggressive mode'. 'Proposal 1:' shows 'Encryption' as 'DES', 'Authentication' as 'SHA', 'Group' as '768-bit', and 'Key Lifetime' as '3600 seconds'. A note below states: '(Note: Following three additional proposals are also proposed in Main mode: DES/MD5/768, 3DES/SHA/1024 and 3DES/MD5/1024)'. Under 'Phase 2:', 'Proposal:' shows 'Encryption' as 'DES', 'Authentication' as 'MD5', 'PFS' as 'OFF', 'Group' as '768-bit', and 'Key Lifetime' as '3600 seconds'. At the bottom, 'Other Setting:' includes checkboxes for 'NetBIOS broadcast', 'Anti-replay', and 'Keep-Alive'. At the very bottom are 'Save Settings' and 'Cancel Changes' buttons.

Figure 5-26: Advanced VPN Tunnel Setup

Wireless-G ADSL Gateway

- **Key Life Time.** In the Key Lifetime field, you may select to have the key expire at the end of a time period of your choosing. Enter the number of seconds you'd like the key to be used until a re-key negotiation between each endpoint is completed.

Other Setting

- **NetBIOS broadcast.** Check the box next to NetBIOS broadcast to enable NetBIOS traffic to pass through the VPN tunnel.
- **Anti-replay.** Check the box next to Anti-replay to enable the Anti-replay protection. This feature keeps track of sequence numbers as packets arrive, ensuring security at the IP packet-level.
- **Keep-Alive.** If you select this option, the Gateway will periodically check your Internet connection. If you are disconnected, then the Gateway will automatically re-establish your connection.
- Check this box to block unauthorized IP addresses. Enter in the field to specify how many times IKE must fail before blocking that unauthorized IP address. Enter the length of time that you specify (in seconds) in the field.

When finished making your changes on this tab, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes. For further help on this tab, click the **Help** button.

The Access Restrictions Tab

Internet Access

The Access Restrictions tab allows you to block or allow specific kinds of Internet usage. You can set up Internet access policies for specific computers and set up filters by using network port numbers.

- Internet Access Policy. Multiple Filters can be saved as Internet Access Policies. When you wish to edit one, select the number of the Policy from the drop-down menu. The tab will change to reflect the settings of this Policy. If you wish to delete this Policy, click the **Delete** button. To see a summary of all Policies, click the **Summary** button.

The summaries are listed on this screen with their name and settings. To return to the Filters tab, click the **Close** button.

- Enter Policy Name. Policies are created from the fields presented here.

To create an Internet Access policy:

- Enter a Policy Name in the field provided. Select **Internet Access** as the Policy Type.
- Click the **Edit List of PCs** button. This will open the List of PCs screen. From this screen, you can enter the IP address or MAC address of any computer to which this policy will apply. You can even enter ranges of computers by IP address. Click the **Save Settings** button to save your settings, the **Cancel Changes** button to undo any changes and return to the Filters tab.

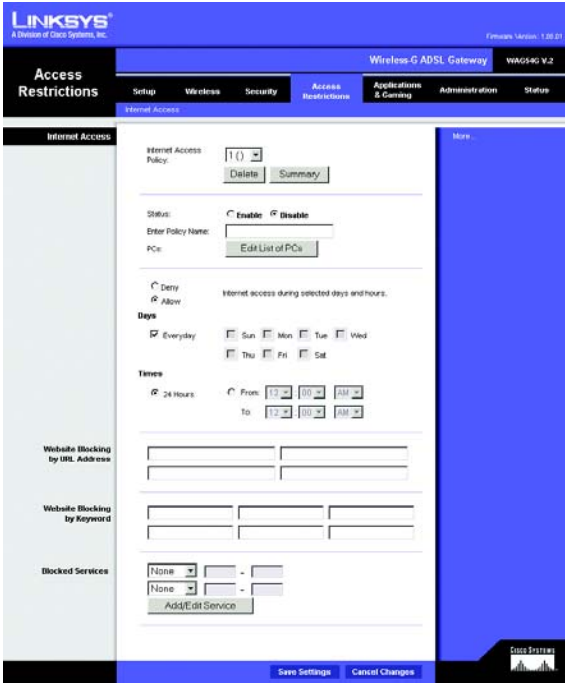


Figure 5-27: Internet Access

Internet Policy Summary

No.	Policy Name	Days	Time of Day	Delete
1.	---	SMTWTFSS	---	<input type="checkbox"/>
2.	---	SMTWTFSS	---	<input type="checkbox"/>
3.	---	SMTWTFSS	---	<input type="checkbox"/>
4.	---	SMTWTFSS	---	<input type="checkbox"/>
5.	---	SMTWTFSS	---	<input type="checkbox"/>
6.	---	SMTWTFSS	---	<input type="checkbox"/>
7.	---	SMTWTFSS	---	<input type="checkbox"/>
8.	---	SMTWTFSS	---	<input type="checkbox"/>
9.	---	SMTWTFSS	---	<input type="checkbox"/>
10.	---	SMTWTFSS	---	<input type="checkbox"/>

Close

Figure 5-28: Internet Policy Summary

3. If you wish to Deny or Allow Internet access for those computers you listed on the List of PCs screen, click the option.
4. You can filter access to various services accessed over the Internet, such as FTP or Telnet, by selecting a service from the drop-down menus next to Blocked Services. If a service isn't listed, you can click the **Add/Edit Service** button to open the Port Services screen and add a service to the list. You will need to enter a Service name, as well as the Protocol and Port Range used by the service.
5. By selecting the appropriate setting next to Days and Time, choose when Internet access will be filtered.
6. Click the **Save Settings** button to activate the policy.

Internet Access can also be filtered by URL Address, the address entered to access Internet sites, by entering the address in one of the Website Blocking by URL Address fields. If you do not know the URL Address, filtering can be done by Keyword by entering a keyword in one of the Website Blocking by Keyword fields.

When finished making your changes on this tab, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes.

List of PCs

Enter MAC Address of the PCs in this format: xxxxxxxxxxxx

MAC 01: [00:00:00:00:00:00]	MAC 05: [00:00:00:00:00:00]
MAC 02: [00:00:00:00:00:00]	MAC 06: [00:00:00:00:00:00]
MAC 03: [00:00:00:00:00:00]	MAC 07: [00:00:00:00:00:00]
MAC 04: [00:00:00:00:00:00]	MAC 08: [00:00:00:00:00:00]

Enter the IP Address of the PCs

IP 01: 192.168.1. [0]	IP 04: 192.168.1. [0]
IP 02: 192.168.1. [0]	IP 05: 192.168.1. [0]
IP 03: 192.168.1. [0]	IP 06: 192.168.1. [0]

Enter the IP Range of the PCs

IP Range 01: 192.168.1. [0] ~ [0]	IP Range 02: 192.168.1. [0] ~ [0]
-----------------------------------	-----------------------------------

[Save Settings] [Cancel Changes]

Figure 5-29: List of PCs

Service Name
[DNS]

Protocol
[UDP]

Port Range
[53] ~ [53]

[Add] [Modify] [Delete]

DNS [53 ~ 53]

Ping [0 ~ 0]

HTTP [80 ~ 80]

HTTPS [443 ~ 443]

FTP [21 ~ 21]

POP3 [110 ~ 110]

IMAP [143 ~ 143]

SMTP [25 ~ 25]

NNTP [119 ~ 119]

Telnet [23 ~ 23]

SNMP [161 ~ 161]

TFTP [69 ~ 69]

[Apply] [Cancel] [Close]

Figure 5-30: Port Services

The Applications and Gaming Tab

Single Port Forwarding

The Single Port Forwarding screen provides options for customization of port services for common applications.

When users send this type of request to your network via the Internet, the Gateway will forward those requests to the appropriate computer. Any computer whose port is being forwarded should have its DHCP client function disabled and should have a new static IP address assigned to it because its IP address may change when using the DHCP function.

Choose or enter the Application in the field. Then, enter the External and Internal Port numbers in the fields. Select the type of protocol you wish to use for each application: **TCP** or **UDP**. Enter the IP Address in the field. Click **Enabled** to enable Forwarding for the chosen application.

When finished making your changes on this tab, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes.

Port Range Forwarding

The Port Forwarding screen sets up public services on your network, such as web servers, ftp servers, e-mail servers, or other specialized Internet applications. (Specialized Internet applications are any applications that use Internet access to perform functions such as videoconferencing or online gaming. Some Internet applications may not require any forwarding.)

When users send this type of request to your network via the Internet, the Gateway will forward those requests to the appropriate computer. Any computer whose port is being forwarded should have its DHCP client function disabled and should have a new static IP address assigned to it because its IP address may change when using the DHCP function.

- **Application.** Enter the name you wish to give each application.
- **Start and End.** Enter the starting and ending numbers of the port you wish to forward.
- **TCP UDP.** Select the type of protocol you wish to use for each application: **TCP**, **UDP**, or **Both**.
- **IP Address.** Enter the IP Address and Click **Enabled**.

When finished making your changes on this tab, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes.

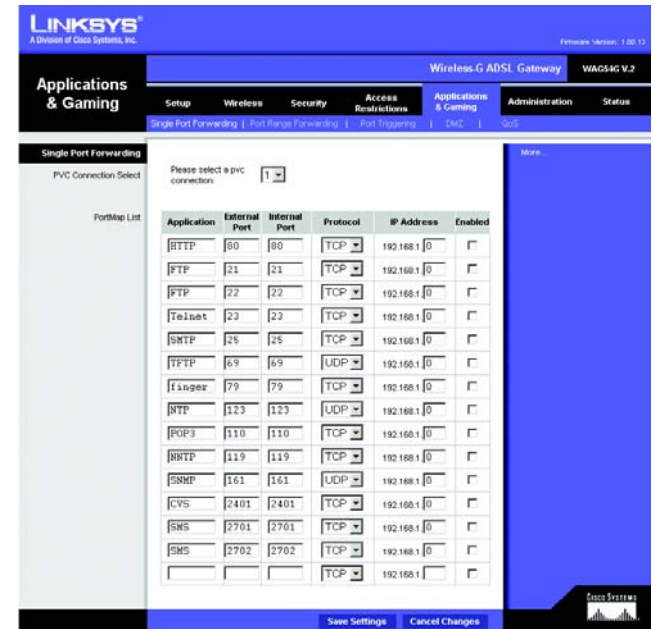


Figure 5-31: Single Port Forwarding

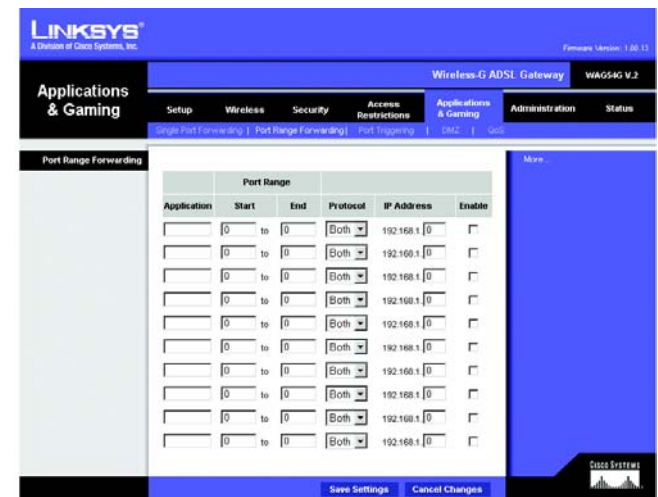


Figure 5-32: Port Range Forwarding

Port Triggering

Port Triggering is used for special applications that can request a port to be opened on demand. For this feature, the Gateway will watch outgoing data for specific port numbers. The Gateway will remember the IP address of the computer that sends a transmission requesting data, so that when the requested data returns through the Gateway, the data is pulled back to the proper computer by way of IP address and port mapping rules.

- **Application.** Enter the name you wish to give each application.
- **Start Port and End Port.** Enter the starting and ending Triggered Range numbers and the Incoming Forwarded Range numbers of the port you wish to forward.

When finished making your changes on this tab, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes.

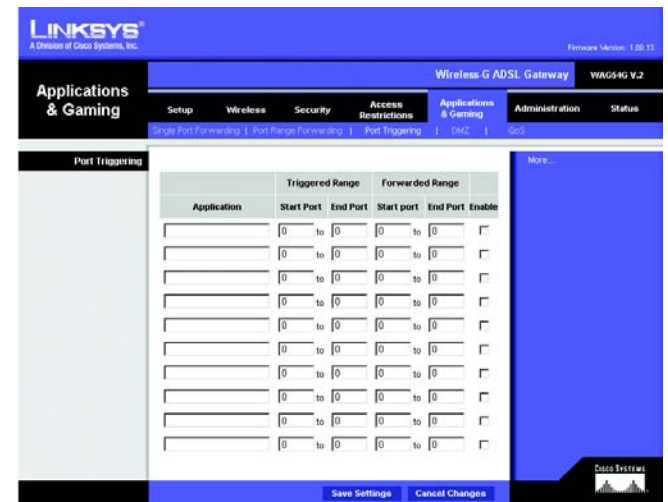


Figure 5-33: Port Triggering

DMZ

The DMZ screen allows one local user to be exposed to the Internet for use of a special-purpose service such as Internet gaming and videoconferencing through DMZ Hosting. DMZ hosting forwards all the ports for one computer at the same time, which differs from Port Range Forwarding, which can only forward a maximum of 10 ranges of ports.

- **DMZ Hosting.** This feature allows one local user to be exposed to the Internet for use of a special-purpose service such as Internet gaming and videoconferencing. To use this feature, select **Enabled**. To disable DMZ, select **Disabled**.
- **DMZ Host IP Address.** To expose one computer, enter the computer's IP address. To get the IP address of a computer, refer to "Appendix D: Finding the MAC Address and IP Address for Your Ethernet Adapter."

When finished making your changes on this tab, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes.



Figure 5-34: DMZ

QoS

Quality of Service (QoS) ensures better service to high-priority types of network traffic, which may involve demanding, real-time applications, such as Internet phone calls or videoconferencing.

Application-based QoS

Application-based QoS manages information as it is transmitted and received. Depending on the settings of the *QoS* screen, this feature will assign information a high or low priority for the five preset applications and three additional applications that you specify.

Enable/Disable. To use application-based QoS, select **Enable**. Otherwise, keep the default, **Disable**.

High priority/Medium priority/Low priority. For each application, select **High priority** (traffic on this queue shares 60% of the total bandwidth), **Medium priority** (traffic on this queue shares 18% of the total bandwidth), or **Low priority** (traffic on this queue shares 1% of the total bandwidth).

FTP (File Transfer Protocol). A protocol used to transfer files over a TCP/IP network (Internet, UNIX, etc.). For example, after developing the HTML pages for a website on a local machine, they are typically uploaded to the web server using FTP.

HTTP (HyperText Transport Protocol). The communications protocol used to connect to servers on the World Wide Web. Its primary function is to establish a connection with a web server and transmit HTML pages to the client web browser.

Telnet. A terminal emulation protocol commonly used on Internet and TCP/IP-based networks. It allows a user at a terminal or computer to log onto a remote device and run a program.

SMTP (Simple Mail Transfer Protocol). The standard e-mail protocol on the Internet. It is a TCP/IP protocol that defines the message format and the message transfer agent (MTA), which stores and forwards the mail.

POP3 (Post Office Protocol 3). A standard mail server commonly used on the Internet. It provides a message store that holds incoming e-mail until users log on and download it. POP3 is a simple system with little selectivity. All pending messages and attachments are downloaded at the same time. POP3 uses the SMTP messaging protocol.

Specific Port#. You can add three additional applications by entering their respective port numbers in the *Specific Port#* fields.

Advanced QoS

This setting allows you to specify traffic queue priority.

Fragment packet's size of AF and BE traffic to be equal to the size of EF traffic. Select this option to fragmentize the packet sizes for AF (Assured Forwarding) and BE (Best Effort) queues so that it will increase the efficiency for transporting EF (expedited forwarding) queues. Enter a range between 68~1492 bytes.

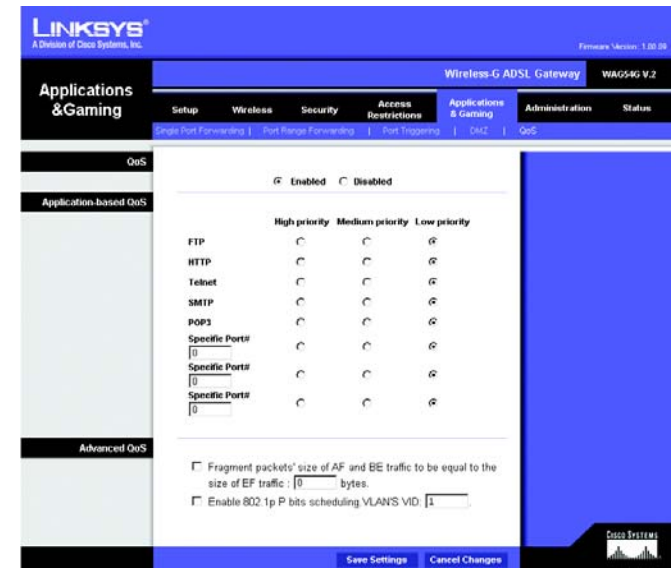


Figure 5-35: QoS

Enable 802.1p P bits scheduling. VLAN's VID. Select this option to enable 802.1p P bits classification scheduling in the appropriate VLAN based on IEEE 802.1Q VLAN identification. Enter the VLAN VID (VLAN Identifier) number in the field.

When you have finished making changes to this screen, click the **Save Settings** button to save the changes, or click the **Cancel Changes** button to undo your changes.

The Administration Tab

Management

The Management screen allows you to change the Gateway's access settings as well as configure the SNMP (Simple Network Management Protocol) and UPnP (Universal Plug and Play) features.

Gateway Access

Local Gateway Access. To ensure the Gateway's security, you will be asked for your password when you access the Gateway's Web-based Utility. The default username and password is admin.

- **Gateway Username.** Enter the default **admin**. It is recommended that you change the default username to one of your choice.
- **Gateway Password.** It is recommended that you change the default password to one of your choice.
- **Re-enter to confirm.** Re-enter the Gateway's new Password to confirm it.
- **Remote Gateway Access.** This feature allows you to access the Gateway from a remote location, via the Internet.



IMPORTANT: Enabling remote Administration allows anyone with access to your password to configure the Gateway from somewhere else on the Internet.

- **Remote Administration.** This feature allows you to manage the Gateway from a remote location via the Internet. To enable Remote Administration, click **Enabled**.
- **Administration Port.** Enter the port number you will use to remotely access the Gateway.

SNMP

SNMP is a popular network monitoring and management protocol.

The screenshot shows the Linksys Administration interface for a Wireless-G ADSL Gateway (WAG54G V.2). The 'Management' tab is selected. The interface is divided into sections for Gateway Access, SNMP, and UPnP.

- Gateway Access:**
 - Local Gateway Access:** Gateway Username: admin, Gateway Password: admin, Re-enter to confirm: admin.
 - Remote Gateway Access:** Remote Management: ☒ Enable ☐ Disable. Remote Username: josh, Remote Password: admin, Re-enter to confirm: admin, Management Port: 81003, Use https: ☐.
- SNMP:** Device Name: WAG54G V.2, SNMP: ☐ Enable ☒ Disable, Get Community: public, Set Community: private.
- UPnP:** UPnP: ☒ Enable ☐ Disable, please select a pvc connection to bind: 1.

At the bottom right, there are buttons for 'Save Settings' and 'Cancel Changes'.

Figure 5-36: Management

Identification. To enable SNMP, click **Enabled**. To disable SNMP, click **Disabled**.

UPnP

UPnP allows Windows XP to automatically configure the Gateway for various Internet applications, such as gaming and videoconferencing.

UPnP. To enable UPnP, click **Enabled**.

When finished making your changes on this tab, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes.

Reporting

The Reporting tab provides you with a log of all incoming and outgoing URLs or IP addresses for your Internet connection. It also provides logs for VPN and firewall events.

- Log. To enable log reporting, click **Enabled**.
- Logviewer IP Address. Enter the IP Address that will receive logs into the field.

Email Alerts

E-Mail Alerts. To enable E-Mail Alerts, click **Enabled**.

- Denial of Service Thresholds. Enter the thresholds of events you want to receive.
- SMTP Mail Server. Enter the IP Address of the SMTP server in the field.
- E-Mail Address for Alert Logs. Enter the e-mail address for alert logs in the field.
- Return E-Mail address. Enter the address for the return e-mail.

To view the logs, click the **View Logs** button.

When finished making your changes on this tab, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes.



Figure 5-37: Reporting

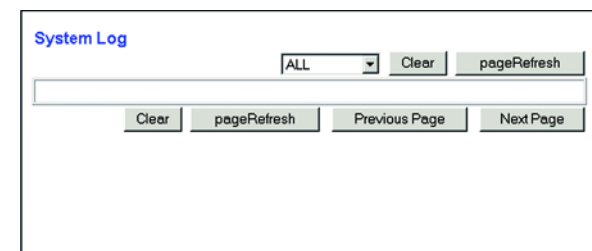


Figure 5-38: System Log

Diagnostics

Ping Test

Ping Test Parameters

- **Ping Target IP.** Enter the IP Address that you want to ping in the field. This can be either a local (LAN) IP or an Internet (WAN) IP address.
- **Ping Size.** Enter the size of the ping packets.
- **Number of Pings.** Enter the number of times that you want to ping.
- **Ping Interval.** Enter the ping interval in milliseconds.
- **Ping Timeout.** Enter the time in milliseconds.
- **Ping Result.** The results of the ping test will be shown here.

Click the **Start Test** button to start the Ping Test.

Backup&Restore

The Backup&Restore tab allows you to back up and restore the Gateway's configuration file.

To back up the Router's configuration file, click the **Backup** button. Then follow the on-screen instructions.

To restore the Router's configuration file, click the **Browse** button to locate the file, and follow the on-screen instructions. After you have selected the file, click the **Restore** button.

Factory Defaults

Restore Factory Defaults. If you wish to restore the Gateway to its factory default settings and lose all your settings, click **Yes**.

To begin the restore process, click the **Save Settings** button to save these changes, or click the **Cancel Changes** button to undo your changes.



Figure 5-39: Ping Test



Figure 5-40: Backup&Restore



Figure 5-41: Factory Defaults

Firmware Upgrade

The ADSL Gateway allows you to upgrade firmware for the LAN (network) side of the Gateway.

Upgrade from LAN

To upgrade the Gateway's firmware from the LAN:

1. Click the **Browse** button to find the firmware upgrade file that you downloaded from the Linksys website and then extracted.
2. Double-click the firmware file you downloaded and extracted. Click the **Upgrade** button, and follow the instructions there.



Figure 5-42: Firmware Upgrade

Reboot

This tab allows you to do a soft or hard reboot of your Gateway.

Reboot Mode. To reboot your Gateway, select **Hard** or **Soft**. Choose hard to power cycle the Gateway or soft to restart it without a power cycle.

To begin the reboot process, click the **Save Settings** button. When a screen appears asking you if you really want to reboot the device. Click **OK**.

Click the **Cancel Changes** button if you want to undo your changes.



Figure 5-43: Reboot ADSL Gateway

The Status Tab

Gateway

This screen displays information about your Gateway and its WAN (Internet) Connections.

Gateway Information

Gateway Information displays the Software Version, MAC Address, and Current Time.

Internet Connections

The Internet Connections will be displayed after selecting the Internet connection number from the drop-down menu. They are the Login Type, interface, IP Address, Subnet Mask, Default Gateway, and DNS 1, 2, and 3 servers.

DHCP Renew. Click the **DHCP Renew** button to replace your Gateway's current IP address with a new IP address.

DHCP Release. Click the **DHCP Release** button to delete your Gateway's current IP address.

Click the **Refresh** button if you want to Refresh your screen.

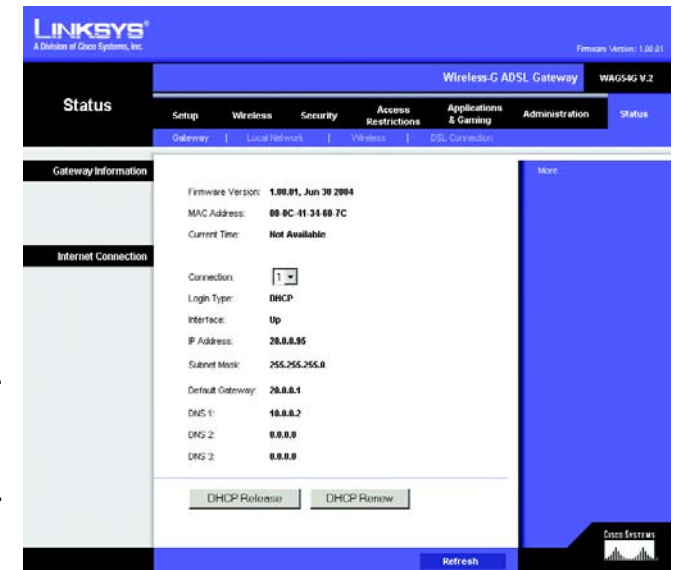


Figure 5-44: Status

Local Network

The Local Network information that is displayed is the local Mac Address, IP Address, Subnet Mask, and DHCP Server, Start IP Address, and End IP Address. To view the DHCP Clients Table, click the **DHCP Clients Table** button.

DHCP Clients Table. Click the **DHCP Clients Table** button to show the current DHCP Client data. You will see the MAC address, computer name, and IP address of the network clients using the DHCP server. (This data is stored in temporary memory and changes periodically.) To delete a client from the DHCP server, select the client, then click the **Delete** button.

Click the **Refresh** button if you want to Refresh your screen. Click the **Close** button to close the screen.



Figure 5-45: Local Network

DHCP Active IP Table

DHCP Server IP Address: 192.168.1.1

Refresh

Client Host Name	IP Address	MAC Address	Expires	Delete
None	None	None	None	

Close

Figure 5-46: DHCP Clients Table

Wireless

The Wireless network information that is displayed is the Wireless Firmware Version, MAC Address, Mode, SSID, DHCP Server, Channel, and Encryption Function.

Click the **Wireless Clients Connected** button to view the wireless clients connected to the Gateway.

Click the **Refresh** button if you want to Refresh your screen. Click the **Close** button to close the screen.



Figure 5-47: Wireless

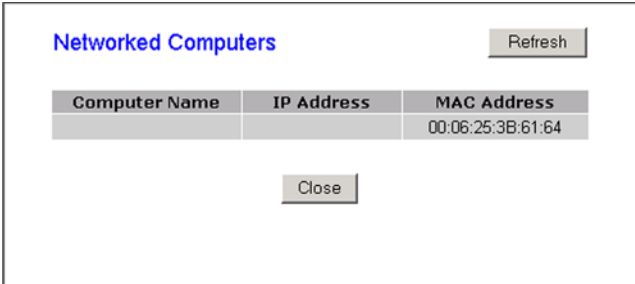


Figure 5-48: Wireless Clients

DSL Connection

The DSL Connection information that is displayed is the Status, Downstream Rate, and Upstream Rate.

The PVC Connection information that is displayed is Encapsulation, Multiplexing, QoS, Pcr Rate, Scr Rate, Autodetect, VPI, VCI, and PVC Status.

Click the **Refresh** button if you want to Refresh your screen.

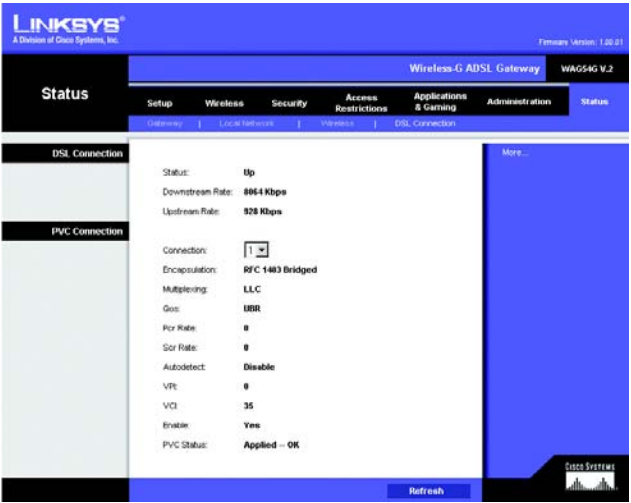


Figure 5-49: DSL Connection

Appendix A: Troubleshooting

This appendix consists of two parts: “Common Problems and Solutions” and “Frequently Asked Questions.” Provided are possible solutions to problems that may occur during the installation and operation of the Gateway. Read the descriptions below to help you solve your problems. If you can’t find an answer here, check the Linksys international website at www.linksys.com/international.

Common Problems and Solutions

1. *I need to set a static IP address on a computer.*

You can assign a static IP address to a computer by performing the following steps:

- For Windows 98 and Me:
 1. Click **Start**, **Settings**, and **Control Panel**. Double-click **Network**.
 2. In The following network components are installed box, select the TCP/IP-> associated with your Ethernet adapter. If you only have one Ethernet adapter installed, you will only see one TCP/IP line with no association to an Ethernet adapter. Highlight it and click the Properties button.
 3. In the TCP/IP properties window, select the IP address tab, and select Specify an IP address. Enter a unique IP address that is not used by any other computer on the network connected to the Gateway. Make sure that each IP address is unique for each computer or network device.
 4. Click the **Gateway** tab, and in the New Gateway prompt, enter 192.168.1.1, which is the default IP address of the Gateway. Click the Add button to accept the entry.
 5. Click the **DNS** tab, and make sure the DNS Enabled option is selected. Enter the Host and Domain names (e.g., John for Host and home for Domain). Enter the DNS entry provided by your ISP. If your ISP has not provided the DNS IP address, contact your ISP to get that information or go to its website for the information.
 6. Click the **OK** button in the TCP/IP properties window, and click Close or the OK button for the Network window.
 7. Restart the computer when asked.
- For Windows 2000:
 1. Click **Start**, **Settings**, and **Control Panel**. Double-click **Network and Dial-Up Connections**.
 2. Right-click the Local Area Connection that is associated with the Ethernet adapter you are using, and select the Properties option.
 3. In the Components checked are used by this connection box, highlight Internet Protocol (TCP/IP), and click the **Properties** button. Select **Use the following IP address** option.
 4. Enter a unique IP address that is not used by any other computer on the network connected to the Gateway.
 5. Enter the Subnet Mask, 255.255.255.0.
 6. Enter the Default Gateway, 192.168.1.1 (Gateway’s default IP address).

7. Toward the bottom of the window, select Use the following DNS server addresses, and enter the Preferred DNS server and Alternative DNS server (provided by your ISP). Contact your ISP or go on its website to find the information.
8. Click the **OK** button in the Internet Protocol (TCP/IP) Properties window, and click the **OK** button in the Local Area Connection Properties window.
9. Restart the computer if asked.
- For Windows XP:
The following instructions assume you are running Windows XP with the default interface. If you are using the Classic interface (where the icons and menus look like previous Windows versions), please follow the instructions for Windows 2000.
 1. Click **Start** and **Control Panel**.
 2. Click the **Network and Internet Connections** icon and then the **Network Connections** icon.
 3. Right-click the **Local Area Connection** that is associated with the Ethernet adapter you are using, and select the Properties option.
 4. In the **This connection uses the following items** box, highlight **Internet Protocol (TCP/IP)**. Click the **Properties** button.
 5. Enter a unique IP address that is not used by any other computer on the network connected to the Gateway.
 6. Enter the Subnet Mask, 255.255.255.0.
 7. Enter the Default Gateway, 192.168.1.1 (Gateway's default IP address).
 8. Toward the bottom of the window, select Use the following DNS server addresses, and enter the Preferred DNS server and Alternative DNS server (provided by your ISP). Contact your ISP or go on its website to find the information.
 9. Click the **OK** button in the Internet Protocol (TCP/IP) Properties window. Click the **OK** button in the Local Area Connection Properties window.

2. I want to test my Internet connection.

A. Check your TCP/IP settings.

For Windows 98, Me, 2000, and XP:

- Refer to Windows Help for details. Make sure Obtain IP address automatically is selected in the settings.

For Windows NT 4.0:

- Click **Start**, **Settings**, and **Control Panel**. Double-click the **Network** icon.
- Click the Protocol tab, and double-click on TCP/IP Protocol.
- When the window appears, make sure you have selected the correct Adapter for your Ethernet adapter and set it for **Obtain an IP address** from a DHCP server.
- Click the **OK** button in the TCP/IP Protocol Properties window, and click the **Close** button in the Network window.
- Restart the computer if asked.

B. Open a command prompt.

For Windows 98 and Me:

- Click **Start** and **Run**. In the Open field, type in command. Press the **Enter** key or click the **OK** button.

For Windows NT, 2000, and XP:

- Click **Start** and **Run**. In the Open field, type cmd. Press the **Enter** key or click the **OK** button. In the command prompt, type ping 192.168.1.1 and press the Enter key.
- If you get a reply, the computer is communicating with the Gateway.
- If you do NOT get a reply, please check the cable, and make sure Obtain an IP address automatically is selected in the TCP/IP settings for your Ethernet adapter.
- C. In the command prompt, type ping followed by your Internet or WAN IP address and press the **Enter** key. The Internet or WAN IP Address can be found on the Status screen of the Gateway's web-based utility. For example, if your Internet or WAN IP address is 1.2.3.4, you would enter ping 1.2.3.4 and press the Enter key.
- If you get a reply, the computer is connected to the Gateway.
- If you do NOT get a reply, try the ping command from a different computer to verify that your original computer is not the cause of the problem.
- D. In the command prompt, type ping www.yahoo.com and press the **Enter** key.
- If you get a reply, the computer is connected to the Internet. If you cannot open a webpage, try the ping command from a different computer to verify that your original computer is not the cause of the problem.
- If you do NOT get a reply, there may be a problem with the connection. Try the ping command from a different computer to verify that your original computer is not the cause of the problem.

3. I am not getting an IP address on the Internet with my Internet connection.

- Refer to "Problem #2, I want to test my Internet connection" to verify that you have connectivity.
 1. Make sure you are using the right Internet connection settings. Contact your ISP to see if your Internet connection type is RFC 1483 Bridged, RFC 1483 Routed, RFC 2516 PPPoE, or RFC 2364 PPPoA. Please refer to the Setup section of "Chapter 5: Configuring the Gateway" for details on Internet connection settings.
 2. Make sure you have the right cable. Check to see if the Gateway column has a solidly lit ADSL LED.
 3. Make sure the cable connecting from your Gateway's ADSL port is connected to the wall jack of the ADSL service line. Verify that the Status page of the Gateway's web-based utility shows a valid IP address from your ISP.
 4. Turn off the computer and Gateway. Wait 30 seconds, and then turn on the Gateway, and computer. Check the Status tab of the Gateway's web-based utility to see if you get an IP address.

4. I am not able to access the Setup page of the Gateway's web-based utility.

- Refer to "Problem #2, I want to test my Internet connection" to verify that your computer is properly connected to the Gateway.
 1. Refer to "Appendix D: Finding the MAC Address and IP address for Your Ethernet Adapter" to verify that your computer has an IP Address, Subnet Mask, Gateway, and DNS.
 2. Set a static IP address on your system; refer to "Problem #1: I need to set a static IP address."

3. Refer to “Problem #10: I need to remove the proxy settings or the dial-up pop-up window (for PPPoE users).”

5. *I can't get my Virtual Private Network (VPN) working through the Gateway.*

Access the Gateway's web interface by going to <http://192.168.1.1> or the IP address of the Gateway, and go to the Security tab. Make sure you have IPsec passthrough and/or PPTP pass-through enabled.

- VPNs that use IPsec with the ESP (Encapsulation Security Payload known as protocol 50) authentication will work fine. At least one IPsec session will work through the Gateway; however, simultaneous IPsec sessions may be possible, depending on the specifics of your VPNs.
- VPNs that use IPsec and AH (Authentication Header known as protocol 51) are incompatible with the Gateway. AH has limitations due to occasional incompatibility with the NAT standard.
- Change the IP address for the Gateway to another subnet to avoid a conflict between the VPN IP address and your local IP address. For example, if your VPN server assigns an IP address 192.168.1.X (X is a number from 1 to 254) and your local LAN IP address is 192.168.1.X (X is the same number used in the VPN IP address), the Gateway will have difficulties routing information to the right location. If you change the Gateway's IP address to 192.168.2.1, that should solve the problem. Change the Gateway's IP address through the Setup tab of the web interface.
- If you assigned a static IP address to any computer or network device on the network, you need to change its IP address accordingly to 192.168.2.Y (Y being any number from 1 to 254). Note that each IP address must be unique within the network.
- Your VPN may require port 500/UDP packets to be passed to the computer that is connecting to the IPsec server. Refer to “Problem #7, I need to set up online game hosting or use other Internet applications” for details.
- Check the Linksys international website for more information at www.linksys.com/international.

6. *I need to set up a server behind my Gateway and make it available to the public.*

To use a server like a web, ftp, or mail server, you need to know the respective port numbers they are using. For example, port 80 (HTTP) is used for web; port 21 (FTP) is used for FTP, and port 25 (SMTP outgoing) and port 110 (POP3 incoming) are used for the mail server. You can get more information by viewing the documentation provided with the server you installed.

- Follow these steps to set up port forwarding through the Gateway's web-based utility. We will be setting up web, ftp, and mail servers.
 1. Access the Gateway's web-based utility by going to <http://192.168.1.1> or the IP address of the Gateway. Go to the Applications and Gaming => Port Range Forwarding tab.
 2. Enter any name you want to use for the Customized Application.
 3. Enter the External Port range of the service you are using. For example, if you have a web server, you would enter the range 80 to 80.
 4. Check the protocol you will be using, TCP and/or UDP.
 5. Enter the IP address of the computer or network device that you want the port server to go to. For example, if the web server's Ethernet adapter IP address is 192.168.1.100, you would enter 100 in the

field provided. Check “Appendix D: Finding the MAC Address and IP Address for Your Ethernet Adapter” for details on getting an IP address.

6. Check the Enable option for the port services you want to use. Consider the example below:

Customized Application	External Port	TCP	UDP	IP Address	Enable
Web server	80 to 80	X		192.168.1.100	X
FTP server	21 to 21	X		192.168.1.101	X
SMTP (outgoing)	25 to 25	X		192.168.1.102	X
POP3 (incoming)	110 to 110	X		192.168.1.102	X

When you have completed the configuration, click the **Save Settings** button.

7. *I need to set up online game hosting or use other Internet applications.*

If you want to play online games or use Internet applications, most will work without doing any port forwarding or DMZ hosting. There may be cases when you want to host an online game or Internet application. This would require you to set up the Gateway to deliver incoming packets or data to a specific computer. This also applies to the Internet applications you are using. The best way to get the information on what port services to use is to go to the website of the online game or application you want to use. Follow these steps to set up online game hosting or use a certain Internet application:

1. Access the Gateway’s web interface by going to <http://192.168.1.1> or the IP address of the Gateway. Go to the Applications and Gaming => Port Range Forwarding tab.
2. Enter any name you want to use for the Customized Application.
3. Enter the External Port range of the service you are using. For example, if you want to host Unreal Tournament (UT), you would enter the range 7777 to 27900.
4. Check the protocol you will be using, TCP and/or UDP.
5. Enter the IP address of the computer or network device that you want the port server to go to. For example, if the web server’s Ethernet adapter IP address is 192.168.1.100, you would enter 100 in the field provided. Check “Appendix D: Finding the MAC Address and IP Address for Your Ethernet Adapter” for details on getting an IP address.
6. Check the **Enable** option for the port services you want to use. Consider the example below:

Customized Application	External Port	TCP	UDP	IP Address	Enable
UT	7777 to 27900	X	X	192.168.1.100	X
Half-life	27015 to 27015	X	X	192.168.1.105	X
PC Anywhere	5631 to 5631		X	192.168.1.102	X
VPN IPSEC	500 to 500		X	192.168.1.100	X

When you have completed the configuration, click the **Save Settings** button.

8. I can't get the Internet game, server, or application to work.

If you are having difficulties getting any Internet game, server, or application to function properly, consider exposing one computer to the Internet using DeMilitarized Zone (DMZ) hosting. This option is available when an application requires too many ports or when you are not sure which port services to use. Make sure you disable all the forwarding entries if you want to successfully use DMZ hosting, since forwarding has priority over DMZ hosting. (In other words, data that enters the Gateway will be checked first by the forwarding settings. If the port number that the data enters from does not have port forwarding, then the Gateway will send the data to whichever computer or network device you set for DMZ hosting.)

- Follow these steps to set DMZ hosting:
 1. Access the Gateway's web-based utility by going to <http://192.168.1.1> or the IP address of the Gateway. Go to the Applications and Gaming => DMZ tab. Click Enabled and enter the IP of the computer.
 2. Check the Port Forwarding pages and disable or remove the entries you have entered for forwarding. Keep this information in case you want to use it at a later time.
- Once completed with the configuration, click the **Save Settings** button.

9. I forgot my password, or the password prompt always appears when I am saving settings to the Gateway.

- Reset the Gateway to factory default by pressing the Reset button for 10 seconds and then releasing it. If you are still getting prompted for a password when saving settings, then perform the following steps:
 1. Access the Gateway's web-based utility by going to <http://192.168.1.1> or the IP address of the Gateway. Enter the default username and password **admin**, and click the **Administrations => Management** tab.
 2. Enter a different password in the Gateway Password field, and enter the same password in the second field to confirm the password.
 3. Click the **Save Settings** button.

10. I am a PPPoE user, and I need to remove the proxy settings or the dial-up pop-up window.

If you have proxy settings, you need to disable these on your computer. Because the Gateway is the gateway for the Internet connection, the computer does not need any proxy settings to gain access. Please follow these directions to verify that you do not have any proxy settings and that the browser you use is set to connect directly to the LAN.

- For Microsoft Internet Explorer 5.0 or higher:
 1. Click **Start**, **Settings**, and **Control Panel**. Double-click Internet Options.
 2. Click the **Connections** tab.
 3. Click the **LAN settings** button and remove anything that is checked.
 4. Click the **OK** button to go back to the previous screen.
 5. Click the option **Never dial a connection**. This will remove any dial-up pop-ups for PPPoE users.

- For Netscape 4.7 or higher:
 1. Start **Netscape Navigator**, and click **Edit, Preferences, Advanced**, and **Proxies**.
 2. Make sure you have Direct connection to the Internet selected on this screen.
 3. Close all the windows to finish.

11. To start over, I need to set the Gateway to factory default.

Hold the **Reset** button for 10 seconds and then release it. This will return the Internet settings, password, forwarding, and other settings on the Gateway to the factory default settings. In other words, the Gateway will revert to its original factory configuration.

12. I need to upgrade the firmware.

In order to upgrade the firmware with the latest features, you need to go to the Linksys international website and download the latest firmware at www.linksys.com/international.

- Follow these steps:
 1. Go to the Linksys international website at <http://www.linksys.com/international> and select your region or country.
 2. Click the **Products** tab and select the Gateway.
 3. On the Gateway's webpage, click **Firmware**, and then download the latest firmware for the Gateway.
 4. To upgrade the firmware, follow the steps in the Administration section found in "Chapter 5: Configuring the Gateway."

13. The firmware upgrade failed, and/or the Power LED is flashing.

The upgrade could have failed for a number of reasons. Follow these steps to upgrade the firmware and/or make the Power LED stop flashing:

- If the firmware upgrade failed, use the TFTP program (it was downloaded along with the firmware). Open the pdf that was downloaded along with the firmware and TFTP program, and follow the pdf's instructions.
- Set a static IP address on the computer; refer to "Problem #1, I need to set a static IP address." Use the following IP address settings for the computer you are using:
IP Address: 192.168.1.50
Subnet Mask: 255.255.255.0
Gateway: 192.168.1.1
- Perform the upgrade using the TFTP program or the Gateway's web-based utility through its Administration tab.

14. My DSL service's PPPoE is always disconnecting.

PPPoE is not actually a dedicated or always-on connection. The DSL ISP can disconnect the service after a period of inactivity, just like a normal phone dial-up connection to the Internet.

- There is a setup option to "keep alive" the connection. This may not always work, so you may need to re-establish connection periodically.

1. To connect to the Gateway, go to the web browser, and enter `http://192.168.1.1` or the IP address of the Gateway.
 2. Enter the username and password, if asked. (The default username and password is admin.)
 3. On the Setup screen, select the option **Keep Alive**, and set the Redial Period option at 20 (seconds).
 4. Click the **Save Settings** button. Click the **Status** tab, and click the **Connect** button.
 5. You may see the login status display as Connecting. Press the F5 key to refresh the screen, until you see the login status display as Connected.
 6. Click the **Save Settings** button to continue.
- If the connection is lost again, follow steps 1- 6 to re-establish connection.

15. I can't access my e-mail, web, or VPN, or I am getting corrupted data from the Internet.

The Maximum Transmission Unit (MTU) setting may need to be adjusted. By default, the MTU is set automatically.

- If you are having some difficulties, perform the following steps:
 1. To connect to the Gateway, go to the web browser, and enter `http://192.168.1.1` or the IP address of the Gateway.
 2. Enter the username and password, if asked. (The default username and password is admin.)
 3. Look for the MTU option, and select **Manual**. In the Size field, enter 1492.
 4. Click the **Save Settings** button to continue.
- If your difficulties continue, change the Size to different values. Try this list of values, one value at a time, in this order, until your problem is solved:
 - 1462
 - 1400
 - 1362
 - 1300

16. The Power LED flashes continuously.

The Power LED lights up when the device is first powered up. In the meantime, the system will boot up itself and check for proper operation. After finishing the checking procedure, the LED remains steady to show that the system is working fine. If the LED continues to flash after this time, the device is not working properly. Try to flash the firmware by assigning a static IP address to the computer, and then upgrade the firmware. Try using the following settings, IP Address: 192.168.1.50 and Subnet Mask: 255.255.255.0.

17. When I enter a URL or IP address, I get a time-out error or am prompted to retry.

- Check if other computers work. If they do, ensure that your computer's IP settings are correct (IP Address, Subnet Mask, Default Gateway, and DNS). Restart the computer that is having a problem.
- If the computers are configured correctly, but still not working, check the Gateway. Ensure that it is connected and powered on. Connect to it and check its settings. (If you cannot connect to it, check the LAN and power connections.)

- If the Gateway is configured correctly, check your Internet connection (DSL/cable modem, etc.) to see if it is working correctly. You can remove the Gateway to verify a direct connection.
- Manually configure the TCP/IP settings with a DNS address provided by your ISP.
- Make sure that your browser is set to connect directly and that any dial-up is disabled. For Internet Explorer, click **Tools, Internet Options**, and then the **Connection** tab. Make sure that Internet Explorer is set to **Never dial a connection**. For Netscape Navigator, click **Edit, Preferences, Advanced**, and **Proxy**. Make sure that Netscape Navigator is set to **Direct connection to the Internet**.

Frequently Asked Questions

What is the maximum number of IP addresses that the Gateway will support?

The Gateway will support up to 253 IP addresses.

Is IPSec Passthrough supported by the Gateway?

Yes, it is a built-in feature that is enabled by default.

Where is the Gateway installed on the network?

In a typical environment, the Gateway is installed between the ADSL wall jack and the LAN.

Does the Gateway support IPX or AppleTalk?

No. TCP/IP is the only protocol standard for the Internet and has become the global standard for communications. IPX, a NetWare communications protocol used only to route messages from one node to another, and AppleTalk, a communications protocol used on Apple and Macintosh networks, can be used for LAN to LAN connections, but those protocols cannot connect from the Internet to a LAN.

Does the LAN connection of the Gateway support 100Mbps Ethernet?

The Gateway supports 100Mbps over the auto-sensing Fast Ethernet 10/100 switch on the LAN side of the Gateway.

What is Network Address Translation and what is it used for?

Network Address Translation (NAT) translates multiple IP addresses on the private LAN to one public address that is sent out to the Internet. This adds a level of security since the address of a computer connected to the private LAN is never transmitted on the Internet. Furthermore, NAT allows the Gateway to be used with low cost Internet accounts when only one TCP/IP address is provided by the ISP. The user may have many private addresses behind this single address provided by the ISP.

Does the Gateway support any operating system other than Windows 98SE, Windows Millennium, Windows 2000, or Windows XP?

Yes, but Linksys does not, at this time, provide technical support for setup, configuration or troubleshooting of any non-Windows operating systems.

Does the Gateway support ICQ send file?

Yes, with the following fix: click ICQ menu -> preference -> connections tab->, and check I am behind a firewall or proxy. Then set the firewall time-out to 80 seconds in the firewall setting. The Internet user can then send a file to a user behind the Gateway.

I set up an Unreal Tournament Server, but others on the LAN cannot join. What do I need to do?

If you have a dedicated Unreal Tournament server running, you need to create a static IP for each of the LAN computers and forward ports 7777, 7778, 7779, 7780, 7781, and 27900 to the IP address of the server. You can also use a port forwarding range of 7777 ~ 27900. If you want to use the UT Server Admin, forward another port. (Port 8080 usually works well but is used for remote admin. You may have to disable this.) Then in the [UWeb.WebServer] section of the server.ini file, set the ListenPort to 8080 (to match the mapped port above) and ServerName to the IP assigned to the Gateway from your ISP.

Can multiple gamers on the LAN get on one game server and play simultaneously with just one public IP address?

It depends on which network game or what kind of game server you are using. For example, Unreal Tournament supports multi-login with one public IP.

How do I get Half-Life: Team Fortress to work with the Gateway?

The default client port for Half-Life is 27005. The computers on your LAN need to have "+clientport 2700x" added to the HL shortcut command line; the x would be 6, 7, 8, and on up. This lets multiple computers connect to the same server. One problem: Version 1.0.1.6 won't let multiple computers with the same CD key connect at the same time, even if on the same LAN (not a problem with 1.0.1.3). As far as hosting games, the HL server does not need to be in the DMZ. Just forward port 27015 to the local IP address of the server computer.

The web page hangs; downloads are corrupt, or nothing but junk characters are being displayed on the screen. What do I need to do?

Force your Ethernet adapter to 10Mbps or half duplex mode, and turn off the "Auto-negotiate" feature of your Ethernet adapter as a temporary measure. (Please look at the Network Control Panel in your Ethernet adapter's Advanced Properties tab.) Make sure that your proxy setting is disabled in the browser. Check our website at www.linksys.com/international for more information.

If all else fails in the installation, what can I do?

Reset the Gateway by holding down the reset button until the Power LED fully turns on and off. Reset your DSL modem by powering the unit off and then on. Obtain and flash the latest firmware release that is readily available on the Linksys international website, www.linksys.com/international.

How will I be notified of new Gateway firmware upgrades?

All Linksys firmware upgrades are posted on the Linksys international website at www.linksys.com/international, where they can be downloaded for free. To upgrade the Gateway's firmware, use the Administration tab of the

Gateway's web-based utility. If the Gateway's Internet connection is working well, there is no need to download a newer firmware version, unless that version contains new features that you would like to use.

Will the Gateway function in a Macintosh environment?

Yes, but the Gateway's setup pages are accessible only through Internet Explorer 4.0 or Netscape Navigator 4.0 or higher for Macintosh.

I am not able to get the web configuration screen for the Gateway. What can I do?

You may have to remove the proxy settings on your Internet browser, e.g., Netscape Navigator or Internet Explorer. Check with your browser documentation, and make sure that your browser is set to connect directly and that any dial-up is disabled. For Internet Explorer, click Tools, Internet Options, and then the Connection tab. Make sure that Internet Explorer is set to Never dial a connection. For Netscape Navigator, click Edit, Preferences, Advanced, and Proxy. Make sure that Netscape Navigator is set to Direct connection to the Internet.

What is DMZ Hosting?

Demilitarized Zone (DMZ) allows one IP address (computer) to be exposed to the Internet. Some applications require multiple TCP/IP ports to be open. It is recommended that you set your computer with a static IP if you want to use DMZ Hosting. To get the LAN IP address, see "Appendix D: Finding the MAC Address and IP Address for Your Ethernet Adapter."

If DMZ Hosting is used, does the exposed user share the public IP with the Gateway?

No.

Does the Gateway pass PPTP packets or actively route PPTP sessions?

The Gateway allows PPTP packets to pass through.

Is the Gateway cross-platform compatible?

Any platform that supports Ethernet and TCP/IP is compatible with the Gateway.

How many ports can be simultaneously forwarded?

Theoretically, the Gateway can establish 520 sessions at the same time, but you can only forward 10 ranges of ports.

What are the advanced features of the Gateway?

The Gateway's advanced features include Advanced Wireless settings, Filters, Port Forwarding, Routing, and DDNS.

What is the maximum number of VPN sessions allowed by the Gateway?

The maximum number depends on many factors. At least one IPSec session will work through the Gateway; however, simultaneous IPSec sessions may be possible, depending on the specifics of your VPNs.

How can I check whether I have static or DHCP IP Addresses?

Consult your ISP to obtain this information.

How do I get mIRC to work with the Gateway?

Under the Port Forwarding tab, set port forwarding to 113 for the computer on which you are using mIRC.

Can the Gateway act as my DHCP server?

Yes. The Gateway has DHCP server software built-in.

Can I run an application from a remote computer over the wireless network?

This will depend on whether or not the application is designed to be used over a network. Consult the application's documentation to determine if it supports operation over a network.

What is the IEEE 802.11g standard?

It is one of the IEEE standards for wireless networks. The 802.11g standard allows wireless networking hardware from different manufacturers to communicate, provided that the hardware complies with the 802.11g standard. The 802.11g standard states a maximum data transfer rate of 54Mbps and an operating frequency of 2.4GHz.

What IEEE 802.11b and 802.11g features are supported?

The product supports the following IEEE 802.11b and IEEE 802.11g functions:

- CSMA/CA plus Acknowledge protocol
- Multi-Channel Roaming
- Automatic Rate Selection
- RTS/CTS feature
- Fragmentation
- Power Management

What is ad-hoc mode?

When a wireless network is set to ad-hoc mode, the wireless-equipped computers are configured to communicate directly with each other, peer-to-peer without the use of an access point.

What is infrastructure mode?

When a wireless network is set to infrastructure mode, the wireless network is configured to communicate with a network through a wireless access point.

What is roaming?

Roaming is the ability of a portable computer user to communicate continuously while moving freely throughout an area greater than that covered by a single access point. Before using the roaming function, the computer must make sure that it is the same channel number with the access point of dedicated coverage area.

To achieve true seamless connectivity, the wireless LAN must incorporate a number of different functions. Each node and access point, for example, must always acknowledge receipt of each message. Each node must maintain contact with the wireless network even when not actually transmitting data. Achieving these functions simultaneously requires a dynamic RF networking technology that links access points and nodes. In such a system, the user's end node undertakes a search for the best possible access to the system. First, it evaluates such factors as signal strength and quality, as well as the message load currently being carried by each access point and the distance of each access point to the wired backbone. Based on that information, the node next selects the right access point and registers its address. Communications between end node and host computer can then be transmitted up and down the backbone.

As the user moves on, the end node's RF transmitter regularly checks the system to determine whether it is in touch with the original access point or whether it should seek a new one. When a node no longer receives acknowledgment from its original access point, it undertakes a new search. Upon finding a new access point, it then re-registers, and the communication process continues.

What is the ISM band?

The FCC and their counterparts outside of the U.S. have set aside bandwidth for unlicensed use in the ISM (Industrial, Scientific and Medical) band. Spectrum in the vicinity of 2.4 GHz, in particular, is being made available worldwide. This presents a truly revolutionary opportunity to place convenient high-speed wireless capabilities in the hands of users around the globe.

What is Spread Spectrum?

Spread Spectrum technology is a wideband radio frequency technique developed by the military for use in reliable, secure, mission-critical communications systems. It is designed to trade off bandwidth efficiency for reliability, integrity, and security. In other words, more bandwidth is consumed than in the case of narrowband transmission, but the trade-off produces a signal that is, in effect, louder and thus easier to detect, provided that the receiver knows the parameters of the spread-spectrum signal being broadcast. If a receiver is not tuned to the right frequency, a spread-spectrum signal looks like background noise. There are two main alternatives, Direct Sequence Spread Spectrum (DSSS) and Frequency Hopping Spread Spectrum (FHSS).

What is DSSS? What is FHSS? And what are their differences?

Frequency-Hopping Spread-Spectrum (FHSS) uses a narrowband carrier that changes frequency in a pattern that is known to both transmitter and receiver. Properly synchronized, the net effect is to maintain a single logical channel. To an unintended receiver, FHSS appears to be short-duration impulse noise. Direct-Sequence Spread-Spectrum (DSSS) generates a redundant bit pattern for each bit to be transmitted. This bit pattern is called a chip (or chipping code). The longer the chip, the greater the probability that the original data can be recovered. Even if one or more bits in the chip are damaged during transmission, statistical techniques embedded in the radio can recover the original data without the need for retransmission. To an unintended receiver, DSSS appears as low power wideband noise and is rejected (ignored) by most narrowband receivers.

Will the information be intercepted while it is being transmitted through the air?

WLAN features two-fold protection in security. On the hardware side, as with Direct Sequence Spread Spectrum technology, it has the inherent security feature of scrambling. On the software side, WLAN offers the encryption function (WEP) to enhance security and access control.

What is WEP?

WEP is Wired Equivalent Privacy, a data privacy mechanism based on a 64-bit or 128-bit shared key algorithm, as described in the IEEE 802.11 standard.

What is a MAC Address?

The Media Access Control (MAC) address is a unique number assigned by the manufacturer to any Ethernet networking device, such as a network adapter, that allows the network to identify it at the hardware level. For all practical purposes, this number is usually permanent. Unlike IP addresses, which can change every time a computer logs onto the network, the MAC address of a device stays the same, making it a valuable identifier for the network.

How do I reset the Gateway?

Press the Reset button on the back panel for about ten seconds. This will reset the Gateway to its default settings.

How do I resolve issues with signal loss?

There is no way to know the exact range of your wireless network without testing. Every obstacle placed between the Gateway and a wireless computer will create signal loss. Lead glass, metal, concrete floors, water and walls will inhibit the signal and reduce range. Start with the Gateway and your wireless computer in the same room and move it away in small increments to determine the maximum range in your environment.

You may also try using different channels, as this may eliminate interference affecting only one channel.

I have excellent signal strength, but I cannot see my network.

WEP is probably enabled on the Gateway, but not on your wireless adapter (or vice versa). Verify that the same WEP keys and levels (64 or 128) are being used on all nodes of your wireless network.

How many channels/frequencies are available with the Gateway?

There are eleven available channels, ranging from 1 to 11 (in North America).

If your questions are not addressed here, refer to the Linksys international website, www.linksys.com/international.

Appendix B: Wireless Security

Important Information for Wireless Products

Linksys wants to make wireless networking as safe and easy for you as possible. So, please keep the following points in mind whenever setting up or using your wireless network.

1. Performance.

The actual performance of your wireless network depends on a number of factors, including:

In an Infrastructure environment, your distance from the access point. As you get farther away, the transmission speed will decrease.

Structural interference. The shape of your building or structure, the type of construction, and the building materials used may have an adverse impact on signal quality and speed.

The placement and orientation of the wireless devices.

2. Interference.

Any device operating in the 2.4 GHz spectrum may cause network interference with a 802.11b wireless device. Some devices that may prove troublesome include 2.4 GHz cordless phones, microwave ovens, adjacent public hotspots, and neighboring 802.11b wireless LANs.

3. Security.

The current generation of Linksys products provide several network security features, but they require specific action on your part for implementation.

While the following is a complete list, steps A through E should, at least, be followed:

- A. Change the default SSID.
- B. Disable SSID Broadcasts.
- C. Change the default password for the Administrator account.
- D. Enable MAC Address Filtering.

- E. Change the SSID periodically.
- F. Enable WEP 128-bit Encryption. Please note that this will reduce your network performance.
- G. Change the WEP encryption keys periodically.

For information on implementing these security features, please refer to the User Guide.

4. Security Threats Facing Wireless Networks

Wireless networks are easy to find. Hackers know that in order to join a wireless network, wireless networking products first listen for “beacon messages”. These messages are decrypted and contain much of the network’s information, such as the network’s SSID (Service Set Identifier) and the IP Address of the network PC or access point. Here are the steps you can take:

Change the administrator’s password regularly. With every wireless networking device you use, keep in mind that network settings (SSID, WEP keys, etc.) are stored in its firmware. Your network administrator is the only person who can change network settings. If a hacker gets a hold of the administrator’s password, he, too, can change those settings. So, make it harder for a hacker to get that information. Change the administrator’s password regularly.

SSID. There are several things to keep in mind about the SSID:

- A. Disable Broadcast
- B. Make it unique
- C. Change it often

Most wireless networking devices will give you the option of broadcasting the SSID. While this option may be more convenient, it allows anyone to log into your wireless network. This includes hackers. So, don’t broadcast the SSID.

Wireless networking products come with a default SSID set by the factory. (The Linksys default SSID is “linksys”.) Hackers know these defaults and can check these against your network. Change your SSID to something unique and not something related to your company or the networking products you use.

Change your SSID regularly so that any hackers who have gained access to your wireless network will have start from the beginning in trying to break in.

MAC Addresses. Enable MAC Address filtering. MAC Address filtering will allow you to provide access to only those wireless nodes with certain MAC Addresses. This makes it harder for a hacker to access your network with a random MAC Address.

WEP Encryption. Wired Equivalent Privacy (WEP) is often looked upon as a panacea for wireless security concerns. This is overstating WEP's ability. Again, this can only provide enough security to make a hacker's job more difficult.

There are several ways that WEP can be maximized:

- A. Use the highest level of encryption possible
- B. Use a "Shared" Key
- C. Use multiple WEP keys
- D. Change your WEP key regularly

Implementing encryption will have a negative impact on your network's performance. If you are transmitting sensitive data over your network, encryption should be used.

These security recommendations should help keep your mind at ease while you are enjoying the most flexible and convenient technology Linksys has to offer.

Appendix C: Configuring IPSec between a Windows 2000 or XP Computer and the Gateway

Introduction

This document demonstrates how to establish a secure IPSec tunnel using preshared keys to join a private network inside the Gateway and a Windows 2000 or XP computer. You can find detailed information on configuring the Windows 2000 server at the Microsoft website:

Microsoft KB Q252735 - How to Configure IPSec Tunneling in Windows 2000
<http://support.microsoft.com/support/kb/articles/Q252/7/35.asp>

Microsoft KB Q257225 - Basic IPSec Troubleshooting in Windows 2000
<http://support.microsoft.com/support/kb/articles/Q257/2/25.asp>



NOTE: Keep a record of any changes you make. Those changes will be identical in the Windows “secpol” application and the Router’s Web-Based Utility.

Environment

The IP addresses and other specifics mentioned in this appendix are for illustration purposes only.

Windows 2000 or Windows XP

IP Address: 140.111.1.2 <= User ISP provides IP Address; this is only an example.

Subnet Mask: 255.255.255.0

WAG54G

WAN IP Address: 140.111.1.1 <= User ISP provides IP Address; this is only an example.

Subnet Mask: 255.255.255.0

LAN IP Address: 192.168.1.1

Subnet Mask: 255.255.255.0



NOTE: This section’s instructions and figures refer to the Router. Substitute “Gateway” for “Router”. Also, the text on your screen may differ from the text in your instructions for “OK or Close”; click the appropriate button on your screen.

How to Establish a Secure IPSec Tunnel

Step 1: Create an IPSec Policy

1. Click the **Start** button, select **Run**, and type **secpol.msc** in the **Open** field. The *Local Security Setting* screen will appear as shown in Figure C-1.
2. Right-click **IP Security Policies on Local Computer** (Win XP) or **IP Security Policies on Local Machine** (Win 2000), and click **Create IP Security Policy**.
3. Click the **Next** button, and then enter a name for your policy (for example, to_Router). Then, click **Next**.
4. Deselect the **Activate the default response rule** check box, and then click the **Next** button.
5. Click the **Finish** button, making sure the **Edit** check box is checked.

Step 2: Build Filter Lists

Filter List 1: win->Router

1. In the new policy's properties screen, verify that the **Rules** tab is selected, as shown in Figure C-2. Deselect the **Use Add Wizard** check box, and click the **Add** button to create a new rule.
2. Make sure the **IP Filter List** tab is selected, and click the **Add** button. (See Figure C-3.) The *IP Filter List* screen should appear, as shown in Figure C-4. Enter an appropriate name, such as win->Router, for the filter list, and de-select the **Use Add Wizard** check box. Then, click the **Add** button.

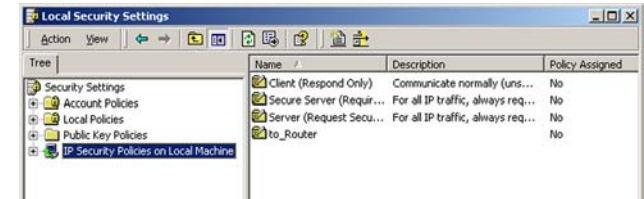


Figure C-1: Local Security Screen



NOTE: The references in this section to “win” are references to Windows 2000 and XP. Substitute the references to “Router” with “Gateway”. Also, the text on your screen may differ from the text in your instructions for “OK or Close”; click the appropriate button on your screen.

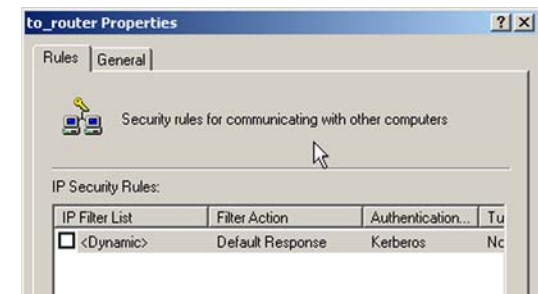


Figure C-2: Rules Tab

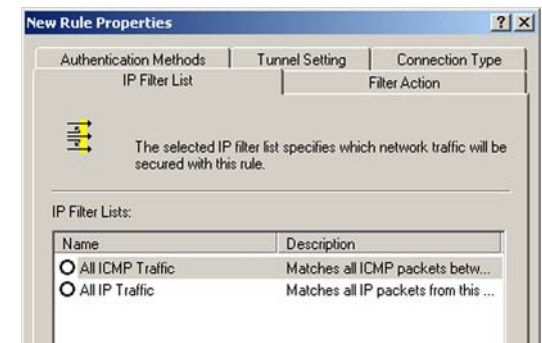


Figure C-3: IP Filter List Tab

3. The *Filters Properties* screen will appear, as shown in Figure C-5. Select the **Addressing** tab. In the *Source address* field, select **My IP Address**. In the *Destination address* field, select **A specific IP Subnet**, and fill in the IP Address: 192.168.1.0 and Subnet mask: 255.255.255.0. (These are the Router's default settings. If you have changed these settings, enter your new values.)

4. If you want to enter a description for your filter, click the **Description** tab and enter the description there.

5. Click the **OK** button. Then, click the **OK** or **Close** button on the *IP Filter List* window.

Filter List 2: Router ->win

6. The *New Rule Properties* screen will appear, as shown in Figure C-6. Select the **IP Filter List** tab, and make sure that **win -> Router** is highlighted. Then, click the **Add** button.

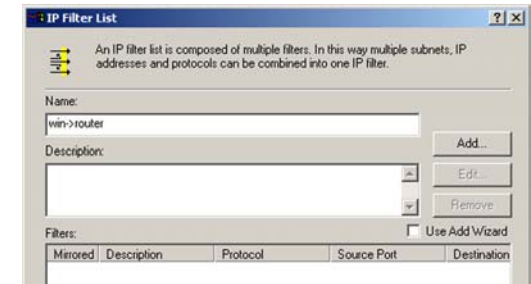


Figure C-4: IP Filter List

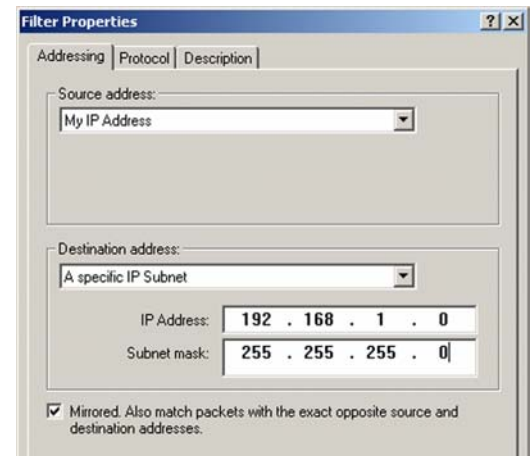


Figure C-5: Filters Properties

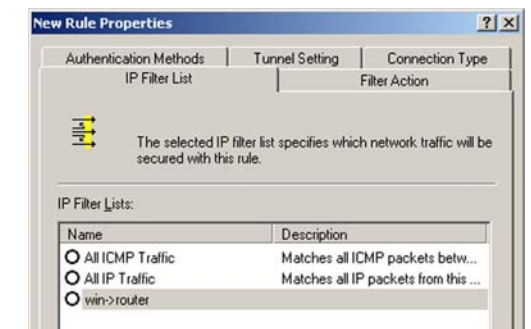


Figure C-6: New Rule Properties

7. The *IP Filter List* screen should appear, as shown in Figure C-7. Enter an appropriate name, such as Router->win for the filter list, and de-select the **Use Add Wizard** check box. Click the **Add** button.
8. The *Filters Properties* screen will appear, as shown in Figure C-8. Select the **Addressing** tab. In the **Source address** field, select **A specific IP Subnet**, and enter the IP Address: 192.168.1.0 and Subnet mask: 255.255.255.0. (Enter your new values if you have changed the default settings.) In the **Destination address** field, select **My IP Address**.
9. If you want to enter a description for your filter, click the *Description* tab and enter the description there.
10. Click the **OK** or **Close** button and the *New Rule Properties* screen should appear with the IP Filter List tab selected, as shown in Figure C-9. There should now be a listing for “Router -> win” and “win -> Router”. Click the **OK** (for WinXP) or **Close** (for Win2000) button on the *IP Filter List* window.

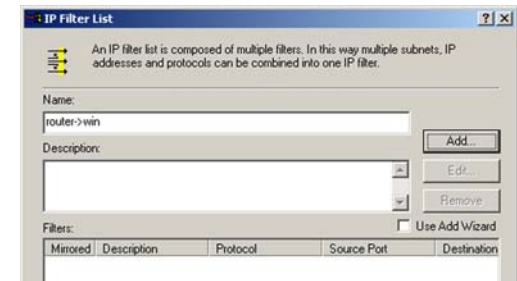


Figure C-7: IP Filter List

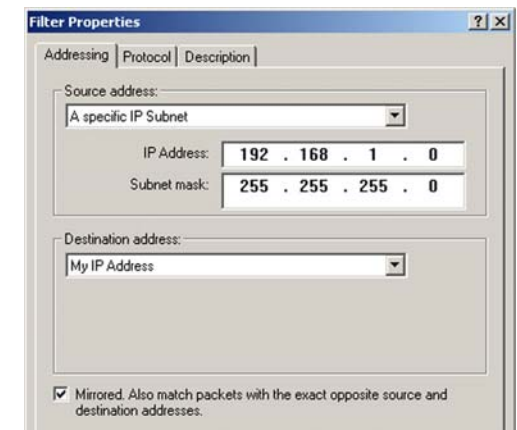


Figure C-8: Filters Properties

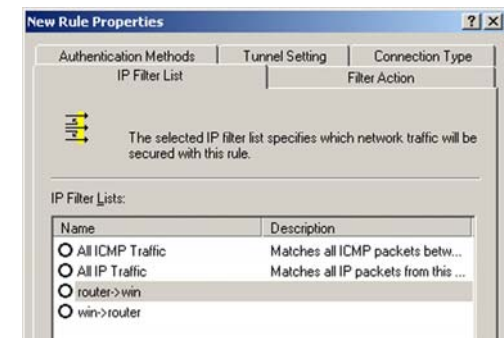


Figure C-9: New Rule Properties

Step 3: Configure Individual Tunnel Rules

Tunnel 1: win->Router

1. From the *IP Filter List* tab, shown in Figure C-10, click the filter list win->Router.
2. Click the **Filter Action** tab (as in Figure C-11), and click the filter action **Require Security** radio button. Then, click the **Edit** button.
3. From the *Security Methods* tab, shown in Figure C-12, verify that the **Negotiate security** option is enabled, and deselect the **Accept unsecured communication, but always respond using IPSec** check box. Select **Session key Perfect Forward Secrecy**, and click the **OK** button.

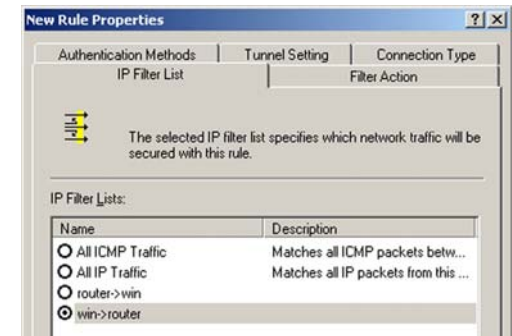


Figure C-10: IP Filter List Tab

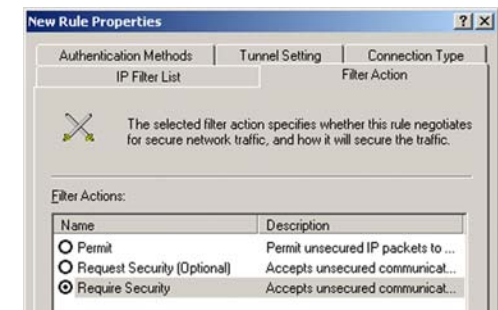


Figure C-11: Filter Action Tab

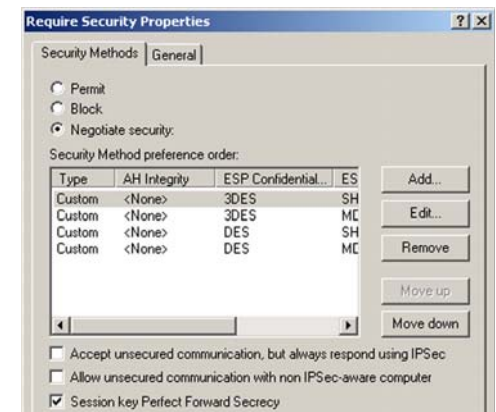


Figure C-12: Security Methods Tab

4. Select the **Authentication Methods** tab, shown in Figure C-13, and click the **Edit** button.
5. Change the authentication method to **Use this string to protect the key exchange (preshared key)**, as shown in Figure C-14, and enter the preshared key string, such as XYZ12345. Click the **OK** button.
6. This new Preshared key will be displayed in Figure C-15. Click the **Apply** button to continue, if it appears on your screen, otherwise proceed to the next step.

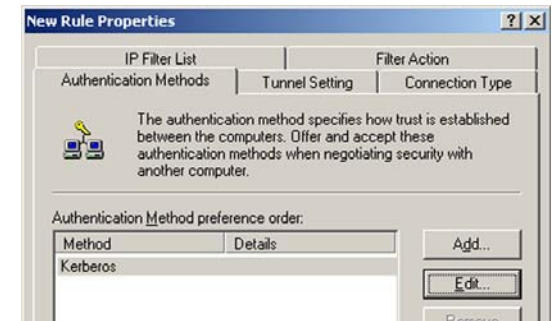


Figure C-13: Authentication Methods

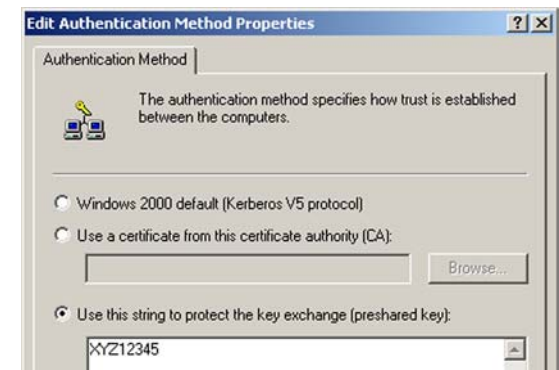


Figure C-14: Preshared Key



Figure C-15: New Preshared Key

7. Select the **Tunnel Setting** tab, shown in Figure C-16, and click **The tunnel endpoint is specified by this IP Address** radio button. Then, enter the Router's WAN IP Address.

8. Select the **Connection Type** tab, as shown in Figure C-17, and click **All network connections**. Then, click the **OK** or **Close** button to finish this rule.

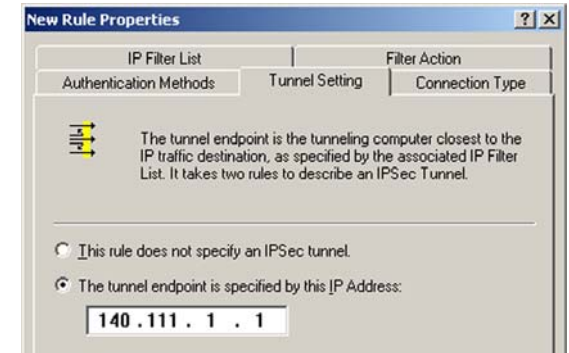


Figure C-16: Tunnel Setting Tab

Tunnel 2: Router->win

9. In the new policy's properties screen, shown in Figure C-18, make sure that "win -> Router" is selected and deselect the **Use Add Wizard** check box. Then, click the **Add** button to create the second IP filter.

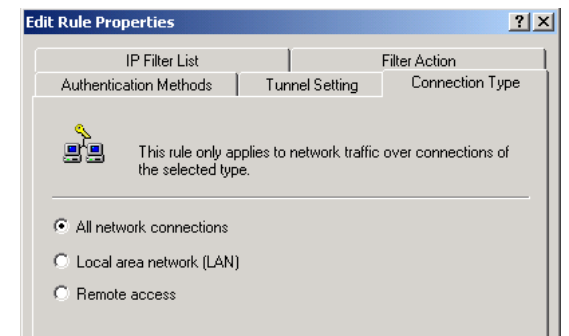


Figure C-17: Connection Type Tab

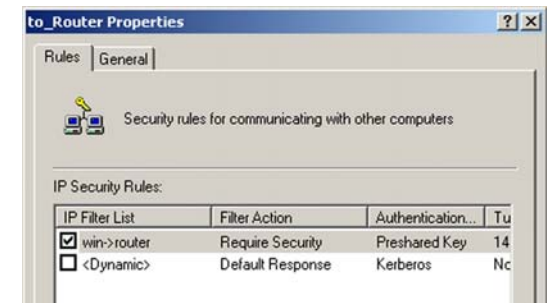


Figure C-18: Properties Screen

10. Go to the **IP Filter List** tab, and click the filter list **Router->win**, as shown in Figure C-19.

11. Click the **Filter Action** tab, and select the filter action **Require Security**, as shown in Figure C-20. Then, click the **Edit** button. From the *Security Methods* tab, shown previously in Figure C-12, verify that the **Negotiate security** option is enabled, and deselect the **Accept unsecured communication, but always respond using IPSec** check box. Select **Session key Perfect Forward Secrecy**, and click the **OK** button.

12. Click the **Authentication Methods** tab, and verify that the authentication method **Kerberos** is selected, as shown in Figure C-21. Then, click the **Edit** button.

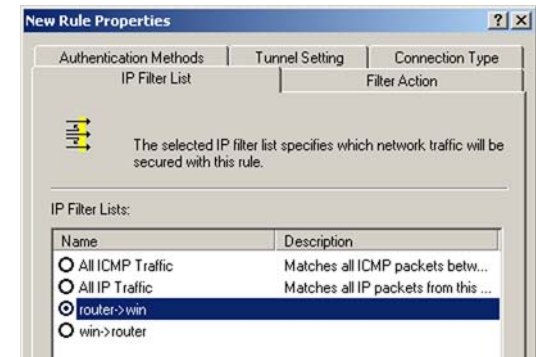


Figure C-19: IP Filter List Tab

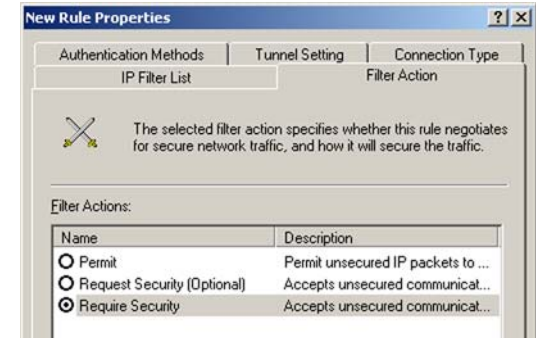


Figure C-20: Filter Action Tab

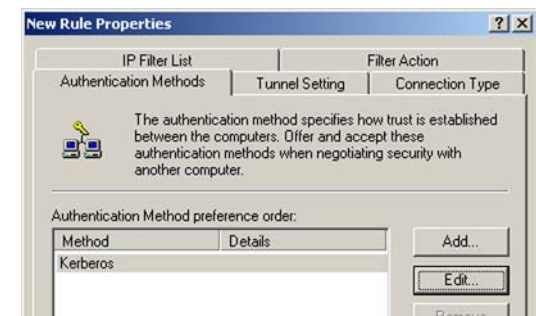


Figure C-21: Authentication Methods Tab

13. Change the authentication method to **Use this string to protect the key exchange (preshared key)**, and enter the preshared key string, such as XYZ12345, as shown in Figure C-22. (This is a sample key string. Yours should be a key that is unique but easy to remember.) Then click the **OK** button.

14. This new Preshared key will be displayed in Figure C-23. Click the **Apply** button to continue, if it appears on your screen, otherwise proceed to the next step.

15. Click the **Tunnel Setting** tab, shown in Figure C-24, click the radio button for **The tunnel endpoint is specified by this IP Address**, and enter the Windows 2000/XP computer's IP Address.



Figure C-22: Preshared Key



Figure C-23: New Preshared Key

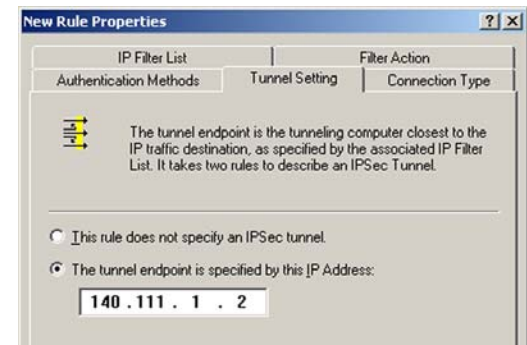


Figure C-24: Tunnel Setting Tab

16. Click the **Connection Type** tab, shown in Figure C-25, and select **All network connections**. Then click the **OK** or **Close** button to finish.

17. From the *Rules* tab, shown in Figure C-26, click the **OK** or **Close** button to return to the secpol screen.



Figure C-25: Connection Type

Step 4: Assign New IPSec Policy

In the IP Security Policies on *Local Computer* window, shown in Figure C-27, right-click the policy named *to_Router*, and click **Assign**. A green arrow appears in the folder icon.

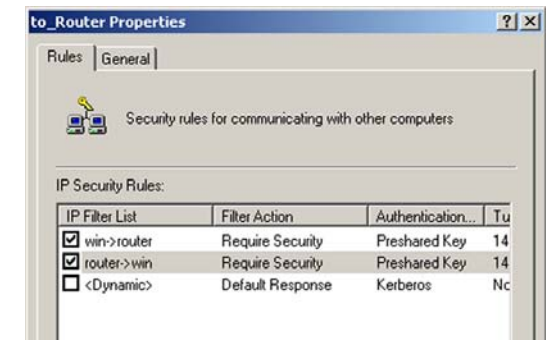


Figure C-26: Rules

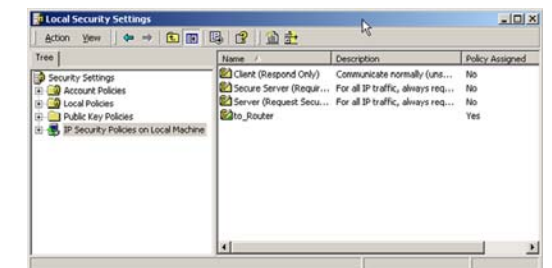


Figure C-27: Local Computer

Step 5: Create a Tunnel Through the Web-Based Utility

1. Open your web browser, and enter **192.168.1.1** in the Address field. Press the **Enter** key.
2. When the User name and Password field appears, enter the default user name and password **admin**. Press the **Enter** key.
3. From the *Setup* tab, click the **VPN** tab.
4. From the *VPN* tab, shown in Figure C-28, select the tunnel you wish to create in the *Select Tunnel Entry* drop-down box. Then click **Enabled**. Enter the name of the tunnel in the *Tunnel Name* field. This is to allow you to identify multiple tunnels and does not have to match the name used at the other end of the tunnel.
5. Enter the IP Address and Subnet Mask of the local VPN Router in the *Local Secure Group* fields. To allow access to the entire IP subnet, enter 0 for the last set of IP Addresses. (e.g. 192.168.1.0).
6. Enter the IP Address and Subnet Mask of the VPN device at the other end of the tunnel (the remote VPN Router or device with which you wish to communicate) in the *Remote Security Router* fields.
7. Select from two different types of encryption: **DES** or **3DES** (3DES is recommended because it is more secure). You may choose either of these, but it must be the same type of encryption that is being used by the VPN device at the other end of the tunnel. Or, you may choose not to encrypt by selecting Disable.
8. Select from two types of authentication: **MD5** and **SHA** (SHA is recommended because it is more secure). As with encryption, either of these may be selected, provided that the VPN device at the other end of the tunnel is using the same type of authentication. Or, both ends of the tunnel may choose to **Disable** authentication.
9. Select the Key Management. Select **Auto (IKE)** and enter a series of numbers or letters in the *Pre-shared Key* field. Check the box next to **PFS** (Perfect Forward Secrecy) to ensure that the initial key exchange and IKE proposals are secure. You may use any combination of up to 24 numbers or letters in this field. No special characters or spaces are allowed. In the *Key Lifetime* field, you may optionally select to have the key expire at the end of a time period of your choosing. Enter the number of seconds you'd like the key to be useful, or leave it blank for the key to last indefinitely.
10. Click the **Save Settings** button to save these changes.

Your tunnel should now be established.

The screenshot shows the Linksys ADSL Gateway Web-Based Utility interface. The top navigation bar includes 'Setup', 'Security', 'Access Restrictions', 'Applications & Gaming', 'Administration', and 'Status'. The 'Security' tab is selected, and the 'VPN' sub-tab is active. The 'VPN Passthrough' section has 'IPSec Pass-Through' and 'PPTP Pass-Through' both set to 'Enabled'. The 'IPSec VPN Tunnel' section shows 'Select Tunnel Entry' as 'Tunnel 1', with 'Delete' and 'Summary' buttons. Below this, 'IPSec VPN Tunnel' is set to 'Enabled'. The 'Local Secure Group' section has 'Subnet' selected, with IP fields set to 0.0.0.0 and Mask to 0.0.0.0. The 'Remote Secure Group' section also has 'Subnet' selected, with IP fields set to 255.255.255.0 and Mask to 255.255.255.0. The 'Remote Security Gateway' section has 'IP Addr.' selected, with IP Address fields set to 0.0.0.0. The 'Encryption' is set to 'DES' and 'Authentication' is set to 'MD5'. The 'Key Management' section has 'Auto (IKE)' selected, 'PFS' is checked, 'Pre-shared Key' is empty, and 'Key Lifetime' is set to 3600 seconds. The 'Status' section shows 'Disconnected'. At the bottom, there are 'Connect', 'View Logs', and 'Advanced Settings' buttons. The 'Save Settings' and 'Cancel Changes' buttons are at the bottom right.

Figure C-28: VPN Tab

Appendix D: Finding the MAC Address and IP Address for Your Ethernet Adapter

This section describes how to find the MAC address for your computer's Ethernet adapter so you can use the MAC filtering feature of the Gateway. You can also find the IP address of your computer's Ethernet adapter. This IP address is used for the Gateway's filtering, forwarding, and/or DMZ features. Follow the steps in this appendix to find the adapter's MAC or IP address in Windows 98, Me, 2000, or XP.

Windows 98 or Me Instructions

1. Click **Start** and **Run**. In the *Open* field, enter **winipcfg**. Then press the **Enter** key or the **OK** button.
2. When the *IP Configuration* screen appears, select the Ethernet adapter you have connected to the Gateway via a CAT 5 Ethernet network cable. See Figure D-1.
3. Write down the Adapter Address as shown on your computer screen (see Figure D-2). This is the MAC address for your Ethernet adapter and is shown in hexadecimal as a series of numbers and letters.

The MAC address/Adapter Address is what you will use for MAC filtering. The example in Figure D-2 shows the Ethernet adapters's MAC address as 00-00-00-00-00-00. Your computer will show something different.

The example in Figure D-2 shows the Ethernet adapter's IP address as 192.168.1.100. Your computer may show something different.



Note: The MAC address is also called the Adapter Address.

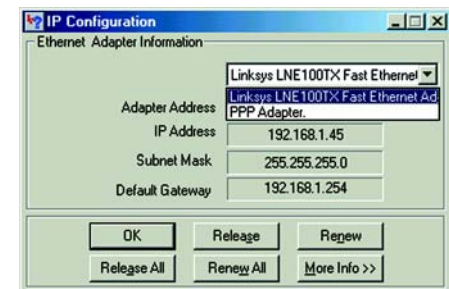


Figure D-1: IP Configuration Screen

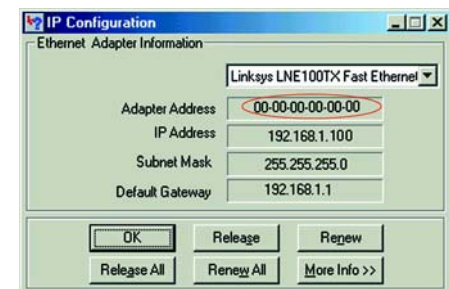


Figure D-2: MAC Address/Adapter Address

Windows 2000 or XP Instructions

1. Click **Start** and **Run**. In the *Open* field, enter **cmd**. Press the **Enter** key or click the **OK** button.



Note: The MAC address is also called the Physical Address.

2. At the command prompt, enter **ipconfig /all**. Then press the **Enter** key.
3. Write down the Physical Address as shown on your computer screen (Figure D-3); it is the MAC address for your Ethernet adapter. This appears as a series of numbers and letters.

The MAC address/Physical Address is what you will use for MAC filtering. The example in Figure D-3 shows the Ethernet adapters's MAC address as 00-00-00-00-00-00. Your computer will show something different.

The example in Figure E-3 shows the Ethernet adapter's IP address as 192.168.1.100. Your computer may show something different.

```

C:\>ipconfig /all

Windows 2000 IP Configuration

Host Name . . . . . : 
Primary DNS Suffix . . . . . : 
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No

Ethernet adapter Local Area Connection:

   Connection-specific DNS Suffix  . : 
   Description . . . . . : Linksys LNE100TX(v5) Fast Ethernet A
   dapter
   Physical Address. . . . . : 00-00-00-00-00-00
   DHCP Enabled. . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
   IP Address. . . . . : 192.168.1.100
   Subnet Mask . . . . . : 255.255.255.0
   Default Gateway . . . . . : 192.168.1.1
   DHCP Server . . . . . : 192.168.1.1
   DNS Servers . . . . . : 192.168.1.1

   Primary WINS Server . . . . . : 192.168.1.1
   Secondary WINS Server . . . . . : 
   Lease Obtained. . . . . : Monday, February 11, 2002 2:31:47 PM
   Lease Expires . . . . . : Tuesday, February 12, 2002 2:31:47 PM
  
```

Figure D-3: MAC Address/Physical Address

Appendix E: Upgrading Firmware

The ADSL Gateway allows you to upgrade firmware for the WAN (Internet) side of the Gateway and the LAN (network) side of the Gateway through the Web-Utility's Firmware Upgrade tab from the Administration tab. Follow these instructions:

Upgrade from WAN

To upgrade the Gateway's firmware from the WAN : Enter the URL for the firmware in the URL field, then click the **Upgrade** button, and follow the instructions there.

Upgrade from LAN

To upgrade the Gateway's firmware from the LAN:

1. Click the **Browse** button to find the firmware upgrade file that you downloaded from the Linksys website and then extracted.
2. Double-click the firmware file you downloaded and extracted. Click the **Upgrade** button, and follow the instructions there.

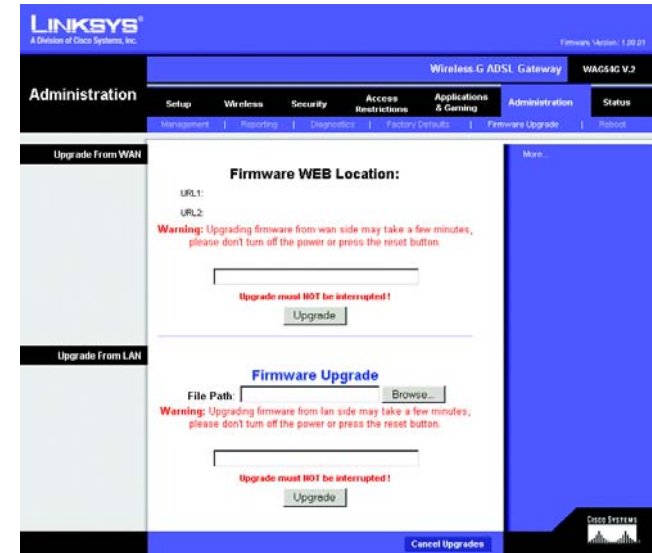


Figure E-1: Upgrade Firmware

Appendix F: Glossary

802.11a - An IEEE wireless networking standard that specifies a maximum data transfer rate of 54Mbps and an operating frequency of 5GHz.

802.11b - An IEEE wireless networking standard that specifies a maximum data transfer rate of 11Mbps and an operating frequency of 2.4GHz.

802.11g - An IEEE wireless networking standard that specifies a maximum data transfer rate of 54Mbps, an operating frequency of 2.4GHz, and backward compatibility with 802.11b devices.

Access Point - Device that allows wireless-equipped computers and other devices to communicate with a wired network. Also used to expand the range of a wireless network.

Adapter - This is a device that adds network functionality to your computer.

Ad-hoc - A group of wireless devices communicating directly with each other (peer-to-peer) without the use of an access point.

Backbone - The part of a network that connects most of the systems and networks together, and handles the most data.

Bandwidth - The transmission capacity of a given device or network.

Beacon Interval - The frequency interval of the beacon, which is a packet broadcast by a Gateway to synchronize a wireless network.

Bit - A binary digit.

Boot - To start a device and cause it to start executing instructions.

Bridge - A device that connects two different kinds of local networks, such as a wireless network to a wired Ethernet network.

Broadband - An always-on, fast Internet connection.

Browser - A browser is an application program that provides a way to look at and interact with all the information on the World Wide Web.

Buffer - A block of memory that temporarily holds data to be worked on later when a device is currently too busy to accept the data.

Cable Modem - A device that connects a computer to the cable television network, which in turn connects to the Internet.

CSMA/CA (Carrier Sense Multiple Access/Collision Avoidance) - A method of data transfer that is used to prevent data loss in a network.

CTS (Clear To Send) - A signal sent by a device to indicate that it is ready to receive data.

Daisy Chain - A method used to connect devices in a series, one after the other.

Database - A collection of data that is organized so that its contents can easily be accessed, managed, and updated.

DDNS (Dynamic Domain Name System) - The capability of having a website, FTP, or e-mail server-with a dynamic IP address-use a fixed domain name.

Default Gateway - A device that forwards Internet traffic from your local area network.

DHCP (Dynamic Host Configuration Protocol) - A protocol that lets one device on a local network, known as a DHCP server, assign temporary IP addresses to the other network devices, typically computers.

DMZ (Demilitarized Zone) - Removes the Gateway's firewall protection from one computer, allowing it to be "seen" from the Internet.

DNS (Domain Name Server) - The IP address of your ISP's server, which translates the names of websites into IP addresses.

Domain - A specific name for a network of computers.

Download - To receive a file transmitted over a network.

DSL (Digital Subscriber Line) - An always-on broadband connection over traditional phone lines.

DSSS (Direct-Sequence Spread-Spectrum) - A type of radio transmission technology that includes a redundant bit pattern to lessen the probability of data lost during transmission. Used in 802.11b networking.

DTIM (Delivery Traffic Indication Message) - A message included in data packets that can increase wireless efficiency.

Dynamic IP Address - A temporary IP address assigned by a DHCP server.

Encryption - Encoding data to prevent it from being read by unauthorized people.

Ethernet - An IEEE standard network protocol that specifies how data is placed on and retrieved from a common transmission medium.

Finger - A program that tells you the name associated with an e-mail address.

Firewall - Security measures that protect the resources of a local network from intruders.

Firmware - 1. In network devices, the programming that runs the device. 2. Programming loaded into read-only memory (ROM) or programmable read-only memory (PROM) that cannot be altered by end-users.

Fragmentation - Breaking a packet into smaller units when transmitting over a network medium that cannot support the original size of the packet.

FTP (File Transfer Protocol) - A standard protocol for sending files between computers over a TCP/IP network and the Internet.

Full Duplex - The ability of a networking device to receive and transmit data simultaneously.

Gateway - A system that interconnects networks.

Half Duplex - Data transmission that can occur in two directions over a single line, but only one direction at a time.

Hardware - The physical aspect of computers, telecommunications, and other information technology devices.

HTTP (HyperText Transport Protocol) - The communications protocol used to connect to servers on the World Wide Web.

IEEE (The Institute of Electrical and Electronics Engineers) - An independent institute that develops networking standards.

Infrastructure - Currently installed computing and networking equipment.

Infrastructure Mode - Configuration in which a wireless network is bridged to a wired network via an access point.

IP (Internet Protocol) - A protocol used to send data over a network.

IP Address - The address used to identify a computer or device on a network.

IPCONFIG - A Windows 2000 and XP utility that displays the IP address for a particular networking device.

IPSec (Internet Protocol Security) - A VPN protocol used to implement secure exchange of packets at the IP layer.

ISM band - Radio band used in wireless networking transmissions.

ISP (Internet Service Provider) - A company that provides access to the Internet.

LAN (Local Area Network) - The computers and networking products that make up the network in your home or office.

MAC (Media Access Control) Address - The unique address that a manufacturer assigns to each networking device.

Mbps (Megabits Per Second) - One million bits per second; a unit of measurement for data transmission.

Multicasting - Sending data to a group of destinations at once.

NAT (Network Address Translation) - NAT technology translates IP addresses of a local area network to a different IP address for the Internet.

Network - A series of computers or devices connected for the purpose of data sharing, storage, and/or transmission between users.

NNTP (Network News Transfer Protocol) - The protocol used to connect to Usenet groups on the Internet.

Node - A network junction or connection point, typically a computer or work station.

OFDM (Orthogonal Frequency Division Multiplexing) - A type of modulation technology that separates the data stream into a number of lower-speed data streams, which are then transmitted in parallel. Used in 802.11a, 802.11g, and powerline networking.

Packet - A unit of data sent over a network.

Passphrase - Used much like a password, a passphrase simplifies the WEP encryption process by automatically generating the WEP encryption keys for Linksys products.

Ping (Packet INternet Groper) - An Internet utility used to determine whether a particular IP address is online.

POP3 (Post Office Protocol 3) - A standard protocol used to retrieve e-mail stored on a mail server.

Port - 1. The connection point on a computer or networking device used for plugging in a cable or an adapter. 2. The virtual connection point through which a computer uses a specific application on a server.

PPPoE (Point to Point Protocol over Ethernet) - A type of broadband connection that provides authentication (username and password) in addition to data transport.

PPTP (Point-to-Point Tunneling Protocol) - A VPN protocol that allows the Point to Point Protocol (PPP) to be tunneled through an IP network. This protocol is also used as a type of broadband connection in Europe.

Preamble - Part of the wireless signal that synchronizes network traffic.

RJ-45 (Registered Jack-45) - An Ethernet connector that holds up to eight wires.

Roaming - The ability to take a wireless device from one access point's range to another without losing the connection.

Router - A networking device that connects multiple networks together, such as a local network and the Internet.

RTS (Request To Send) - A packet sent when a computer has data to transmit. The computer will wait for a CTS (Clear To Send) message before sending data.

Server - Any computer whose function in a network is to provide user access to files, printing, communications, and other services.

SMTP (Simple Mail Transfer Protocol) - The standard e-mail protocol on the Internet.

SNMP (Simple Network Management Protocol) - A widely used network monitoring and control protocol.

Software - Instructions for the computer. A series of instructions that performs a particular task is called a "program".

Spread Spectrum - Wideband radio frequency technique used for more reliable and secure data transmission.

SSID (Service Set Identifier) - Your wireless network's name.

Static IP Address - A fixed address assigned to a computer or device that is connected to a network.

Static Routing - Forwarding data in a network via a fixed path.

Subnet Mask - An address code that determines the size of the network.

Switch - 1. Device that is the central point of connection for computers and other devices in a network, so data can be shared at full transmission speeds. 2. A device for making, breaking, or changing the connections in an electrical circuit.

TCP/IP (Transmission Control Protocol/Internet Protocol) - A network protocol for transmitting data that requires acknowledgement from the recipient of data sent.

Telnet - A user command and TCP/IP protocol used for accessing remote computers.

TFTP (Trivial File Transfer Protocol) - A version of the TCP/IP FTP protocol that uses UDP and has no directory or password capability.

Throughput - The amount of data moved successfully from one node to another in a given time period.

Topology - The physical layout of a network.

TX Rate - Transmission Rate.

UDP (User Datagram Protocol) - A network protocol for transmitting data that does not require acknowledgement from the recipient of the data that is sent.

Upgrade - To replace existing software or firmware with a newer version.

Upload - To transmit a file over a network.

URL (Uniform Resource Locator) - The address of a file located on the Internet.

VPN (Virtual Private Network) - A security measure to protect data as it leaves one network and goes to another over the Internet.

WAN (Wide Area Network) - The Internet.

WEP (Wired Equivalent Privacy) - A method of encrypting data transmitted on a wireless network for greater security.

WINIPCFG - A Windows 98 and Millennium utility that displays the IP address for a particular networking device.

WLAN (Wireless Local Area Network) - A group of computers and associated devices that communicate with each other wirelessly.

Appendix G: Specifications

Standards	IEEE 802.11g, IEEE 802.11b, IEEE 802.3u, IEEE 802.3, G.992.1 (G.dmt), G.992.2 (G.lite), ITU G.992.3, ITU G.992.5, ANSI T1.413i2, WAG54G-E1: Annex-B, WAG54G-DE: UR-2
Ports	Power, LINE (ADSL), Ethernet (1-4)
Buttons	One Reset Button, One On/Off Switch
Cabling Type	UTP CAT 5 or better, Phone Cable (POTS)
Data Rate	Up to 54Mbps (wireless) Up to 8Mbps downstream ADSL Up to 800kbps upstream ADSL
Transmit Power	18 dBm on 802.11b and 15dBm on 802.11g
LEDs	Power, Ethernet (1-4), Wireless-G (WLAN), DSL Internet
Security Features	WEP, WPA, RADIUS
WEP Key Bits	64, 128
Dimensions	186 mm x 48 mm x 188 mm
Unit Weight	0.48 kg
Power	External, 12V DC, 1A
Certifications	FCC Part 15B Class B, FCC Part 15C Class B, FCC Part 68, UL 1950, CSA, CE
Operating Temp.	0°C to 40°C

Wireless-G ADSL Gateway

Storage Temp.	-20°C to 70°C
Operating Humidity	10% to 85% Non-Condensing
Storage Humidity	5% to 90% Non-Condensing

Appendix H: Regulatory Information

FCC Statement

This product has been tested and complies with the specifications for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used according to the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which is found by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment or devices
- Connect the equipment to an outlet other than the receiver's
- Consult a dealer or an experienced radio/TV technician for assistance

FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

Industry Canada (Canada)

This Class B digital apparatus complies with Canadian ICES-003, RSS210.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

The use of this device in a system operating either partially or completely outdoors may require the user to obtain a license for the system according to the Canadian regulations.

Compliance Information for 2.4-GHz Wireless Products Relevant to the EU and Other Countries Following the EU Directive 1999/5/EC (R&TTE Directive)

Declaration of Conformity with Regard to the EU Directive 1999/5/EC (R&TTE Directive)

Česky [Czech]:	Toto zařízení je v souladu se základními požadavky a ostatními odpovídajícími ustanoveními Směrnice 1999/5/EC.
Dansk [Danish]:	Dette udstyr er i overensstemmelse med de væsentlige krav og andre relevante bestemmelser i Direktiv 1999/5/EF.
Deutsch [German]:	Dieses Gerät entspricht den grundlegenden Anforderungen und den weiteren entsprechenden Vorgaben der Richtlinie 1999/5/EU.
Eesti [Estonian]:	See seade vastab direktiivi 1999/5/EÜ olulistele nõuetele ja teistele asjakohastele sätetele.
English:	This equipment is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Español [Spanish]:	Este equipo cumple con los requisitos esenciales así como con otras disposiciones de la Directiva 1999/5/CE.
Ελληνική [Greek]:	Αυτός ο εξοπλισμός είναι σε συμμόρφωση με τις ουσιώδεις απαιτήσεις και άλλες σχετικές διατάξεις της Οδηγίας 1999/5/EC.
Français [French]:	Cet appareil est conforme aux exigences essentielles et aux autres dispositions pertinentes de la Directive 1999/5/EC.
Íslenska [Icelandic]:	Þetta tæki er samkvæmt grunnkröfum og öðrum viðeigandi ákvæðum Tilskipunar 1999/5/EC.
Italiano [Italian]:	Questo apparato é conforme ai requisiti essenziali ed agli altri principi sanciti dalla Direttiva 1999/5/CE.
Latviski [Latvian]:	Šī iekārta atbilst Direktīvas 1999/5/EK būtiskajām prasībām un citiem ar to saistītajiem noteikumiem.
Lietuvių [Lithuanian]:	Šis įrenginys tenkina 1999/5/EB Direktyvos esminius reikalavimus ir kitas šios direktyvos nuostatas.
Nederlands [Dutch]:	Dit apparaat voldoet aan de essentiële eisen en andere van toepassing zijnde bepalingen van de Richtlijn 1999/5/EC.
Malti [Maltese]:	Dan l-apparat huwa konformi mal-htigiet essenzjali u l-provedimenti l-oħra rilevanti tad-Direttiva 1999/5/EC.
Magyar [Hungarian]:	Ez a készülék teljesíti az alapvető követelményeket és más 1999/5/EK irányelvben meghatározott vonatkozó rendelkezéseket.

Wireless-G ADSL Gateway

Norsk [Norwegian]:	Dette utstyret er i samsvar med de grunnleggende krav og andre relevante bestemmelser i EU-direktiv 1999/5/EF.
Polski [Polish]:	Urządzenie jest zgodne z ogólnymi wymaganiami oraz szczególnymi warunkami określonymi Dyrektywą UE: 1999/5/EC.
Português [Portuguese]:	Este equipamento está em conformidade com os requisitos essenciais e outras provisões relevantes da Directiva 1999/5/EC.
Slovensko [Slovenian]:	Ta naprava je skladna z bistvenimi zahtevami in ostalimi relevantnimi pogoji Direktive 1999/5/EC.
Slovensky [Slovak]:	Toto zariadenie je v zhode so základnými požiadavkami a inými príslušnými nariadeniami direktív: 1999/5/EC.
Suomi [Finnish]:	Tämä laite täyttää direktiivin 1999/5/EY olennaiset vaatimukset ja on siinä asetettujen muiden laitetta koskevien määräysten mukainen.
Svenska [Swedish]:	Denna utrustning är i överensstämmelse med de väsentliga kraven och andra relevanta bestämmelser i Direktiv 1999/5/EC.

NOTE: If you need any technical documentation, see the “How to Access Technical Documents on www.linksys.com/international” section for more information.

The following standards were applied during the assessment of the product against the requirements of the Directive 1999/5/EC:

- Radio: EN 300 328
- EMC: EN 301 489-1, EN 301 489-17
- Safety: EN 60950

CE Marking

For the Linksys Wireless-B and Wireless-G products, the following CE mark, notified body number (where applicable), and class 2 identifier are added to the equipment.

CE 0560 ⓘ or CE 0678 ⓘ or CE ⓘ

Check the CE label on the product to find out which notified body was involved during the assessment.

National Restrictions

This product may be used in all EU countries (and other countries following the EU directive 1999/5/EC) without any limitation except for the countries mentioned below:

Ce produit peut être utilisé dans tous les pays de l'UE (et dans tous les pays ayant transposés la directive 1999/5/CE) sans aucune limitation, excepté pour les pays mentionnés ci-dessous:

Questo prodotto è utilizzabile in tutte i paesi EU (ed in tutti gli altri paesi che seguono le direttive EU 1999/5/EC) senza nessuna limitazione, eccetto per i paesi menzionati di seguito:

Das Produkt kann in allen EU Staaten ohne Einschränkungen eingesetzt werden (sowie in anderen Staaten die der EU Direktive 1995/5/CE folgen) mit Ausnahme der folgenden aufgeführten Staaten:

Belgium

The Belgian Institute for Postal Services and Telecommunications (BIPT) must be notified of any outdoor wireless link having a range exceeding 300 meters. Please check <http://www.bipt.be> for more details.

Draadloze verbindingen voor buitengebruik en met een reikwijdte van meer dan 300 meter dienen aangemeld te worden bij het Belgisch Instituut voor postdiensten en telecommunicatie (BIPT). Zie <http://www.bipt.be> voor meer gegevens.

Les liaisons sans fil pour une utilisation en extérieur d'une distance supérieure à 300 mètres doivent être notifiées à l'Institut Belge des services Postaux et des Télécommunications (IBPT). Visitez <http://www.ibpt.be> pour de plus amples détails.

France

In case the product is used outdoors, the output power is restricted in some parts of the band. See Table 1 or check <http://www.art-telecom.fr/> for more details.

Dans la cas d'une utilisation en extérieur, la puissance de sortie est limitée pour certaines parties de la bande. Reportez-vous à la table 1 ou visitez <http://www.art-telecom.fr/> pour de plus amples détails.

Table 1: Applicable Power Levels in France

Location	Frequency Range (MHz)	Power (EIRP)
Indoor (No restrictions)	2400-2483.5	100 mW (20 dBm)
Outdoor	2400-2454	100 mW (20 dBm)
	2454-2483.5	10 mW (10 dBm)

Italy

This product meets the National Radio Interface and the requirements specified in the National Frequency Allocation Table for Italy. Unless operating within the boundaries of the owner's property, the use of this 2.4 GHz Wireless LAN product requires a 'general authorization'. Please check with <http://www.comunicazioni.it/it/> for more details.

Questo prodotto è conforme alla specifiche di Interfaccia Radio Nazionali e rispetta il Piano Nazionale di ripartizione delle frequenze in Italia. Se non viene installato all'interno del proprio fondo, l'utilizzo di prodotti Wireless LAN a 2.4 GHz richiede una "Autorizzazione Generale". Consultare <http://www.comunicazioni.it/it/> per maggiori dettagli.

Product Usage Restrictions

This product is designed for indoor usage only. Outdoor usage is not recommended.

This product is designed for use with the included integral or external (dedicated) antenna(s). Use of non-dedicated or third-party antenna(s) is not recommended and is not supported by Linksys.

Power Output of Your Device

To comply with your country's regulations, you may have to change the power output of your wireless device. Proceed to the appropriate section for your device.

Note: The power output setting may not be available on all wireless products. For more information, refer to the documentation on your product's CD or at <http://www.linksys.com/international>.

Wireless Adapters

Wireless adapters have the power output set to 100% by default. Maximum power output on each adapter does not exceed 20 dBm (100 mW); it is generally 18 dBm (64 mW) or below. If you need to alter your wireless adapter's power output, follow the appropriate instructions for your computer's Windows operating system:

Windows XP

1. Double-click the **Wireless** icon in your desktop's system tray.
2. Open the *Wireless Network Connection* window.
3. Click the **Properties** button.
4. Select the **General** tab, and click the **Configure** button.
5. In the *Properties* window, click the **Advanced** tab.
6. Select **Power Output**.
7. From the pull-down menu on the right, select the wireless adapter's power output percentage.

Windows 2000

1. Open the **Control Panel**.
2. Double-click **Network and Dial-Up Connections**.
3. Select your current wireless connection, and select **Properties**.
4. From the *Properties* screen, click the **Configure** button.
5. Click the **Advanced** tab, and select **Power Output**.
6. From the pull-down menu on the right, select the wireless adapter's power setting.

If your computer is running Windows Millennium or 98, then refer to Windows Help for instructions on how to access the advanced settings of a network adapter.

Wireless Access Points, Routers, or Other Wireless Products

If you have a wireless access point, router or other wireless product, use its Web-based Utility to configure its power output setting (refer to the product's documentation for more information).

Technical Documents on www.linksys.com/international

Follow these steps to access technical documents:

1. Browse to <http://www.linksys.com/international>.
2. Click the region in which you reside.
3. Click the name of the country in which you reside.
4. Click **Products**.
5. Click the appropriate product category.
6. Select a product.
7. Click the type of documentation you want. The document will automatically open in PDF format.

Note: If you have questions regarding the compliance of these products or you cannot find the information you are looking for, please contact your local sales office. Visit <http://www.linksys.com/international> for more details.

Appendix I: Warranty Information

Linksys warrants to You that, for a period of three years (the "Warranty Period"), your Linksys Product will be substantially free of defects in materials and workmanship under normal use. Your exclusive remedy and Linksys' entire liability under this warranty will be for Linksys at its option to repair or replace the Product or refund Your purchase price less any rebates. This limited warranty extends only to the original purchaser.

If the Product proves defective during the Warranty Period call Linksys Technical Support in order to obtain a Return Authorization Number, if applicable. BE SURE TO HAVE YOUR PROOF OF PURCHASE ON HAND WHEN CALLING. If You are requested to return the Product, mark the Return Authorization Number clearly on the outside of the package and include a copy of your original proof of purchase. RETURN REQUESTS CANNOT BE PROCESSED WITHOUT PROOF OF PURCHASE. You are responsible for shipping defective Products to Linksys. Linksys pays for UPS Ground shipping from Linksys back to You only. Customers located outside of the United States of America and Canada are responsible for all shipping and handling charges.

ALL IMPLIED WARRANTIES AND CONDITIONS OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE LIMITED TO THE DURATION OF THE WARRANTY PERIOD. ALL OTHER EXPRESS OR IMPLIED CONDITIONS, REPRESENTATIONS AND WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF NON-INFRINGEMENT, ARE DISCLAIMED. Some jurisdictions do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to You. This warranty gives You specific legal rights, and You may also have other rights which vary by jurisdiction.

This warranty does not apply if the Product (a) has been altered, except by Linksys, (b) has not been installed, operated, repaired, or maintained in accordance with instructions supplied by Linksys, or (c) has been subjected to abnormal physical or electrical stress, misuse, negligence, or accident. In addition, due to the continual development of new techniques for intruding upon and attacking networks, Linksys does not warrant that the Product will be free of vulnerability to intrusion or attack.

TO THE EXTENT NOT PROHIBITED BY LAW, IN NO EVENT WILL LINKSYS BE LIABLE FOR ANY LOST DATA, REVENUE OR PROFIT, OR FOR SPECIAL, INDIRECT, CONSEQUENTIAL, INCIDENTAL OR PUNITIVE DAMAGES, REGARDLESS OF THE THEORY OF LIABILITY (INCLUDING NEGLIGENCE), ARISING OUT OF OR RELATED TO THE USE OF OR INABILITY TO USE THE PRODUCT (INCLUDING ANY SOFTWARE), EVEN IF LINKSYS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT WILL LINKSYS' LIABILITY EXCEED THE AMOUNT PAID BY YOU FOR THE PRODUCT. The foregoing limitations will apply even if any warranty or remedy provided under this Agreement fails of its essential purpose. Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to You.

This Warranty is valid and may be processed only in the country of purchase.

Please direct all inquiries to: Linksys, P.O. Box 18558, Irvine, CA 92623.

Appendix J: Contact Information

Need to contact Linksys?

Visit us online for information on the latest products and updates to your existing products at:
<http://www.linksys.com/international>

If you experience problems with any Linksys product, you can e-mail us at:

In Europe	E-mail Address
Austria	support.at@linksys.com
Belgium	support.be@linksys.com
Denmark	support.dk@linksys.com
France	support.fr@linksys.com
Germany	support.de@linksys.com
Italy	support.it@linksys.com
Netherlands	support.nl@linksys.com
Norway	support.no@linksys.com
Portugal	support.pt@linksys.com
Spain	support.es@linksys.com
Sweden	support.se@linksys.com
Switzerland	support.ch@linksys.com
United Kingdom & Ireland	support.uk@linksys.com

Outside of Europe	E-mail Address
Latin America	support.la@linksys.com
U.S. and Canada	support@linksys.com